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TECHNOLOGY & LEARNING

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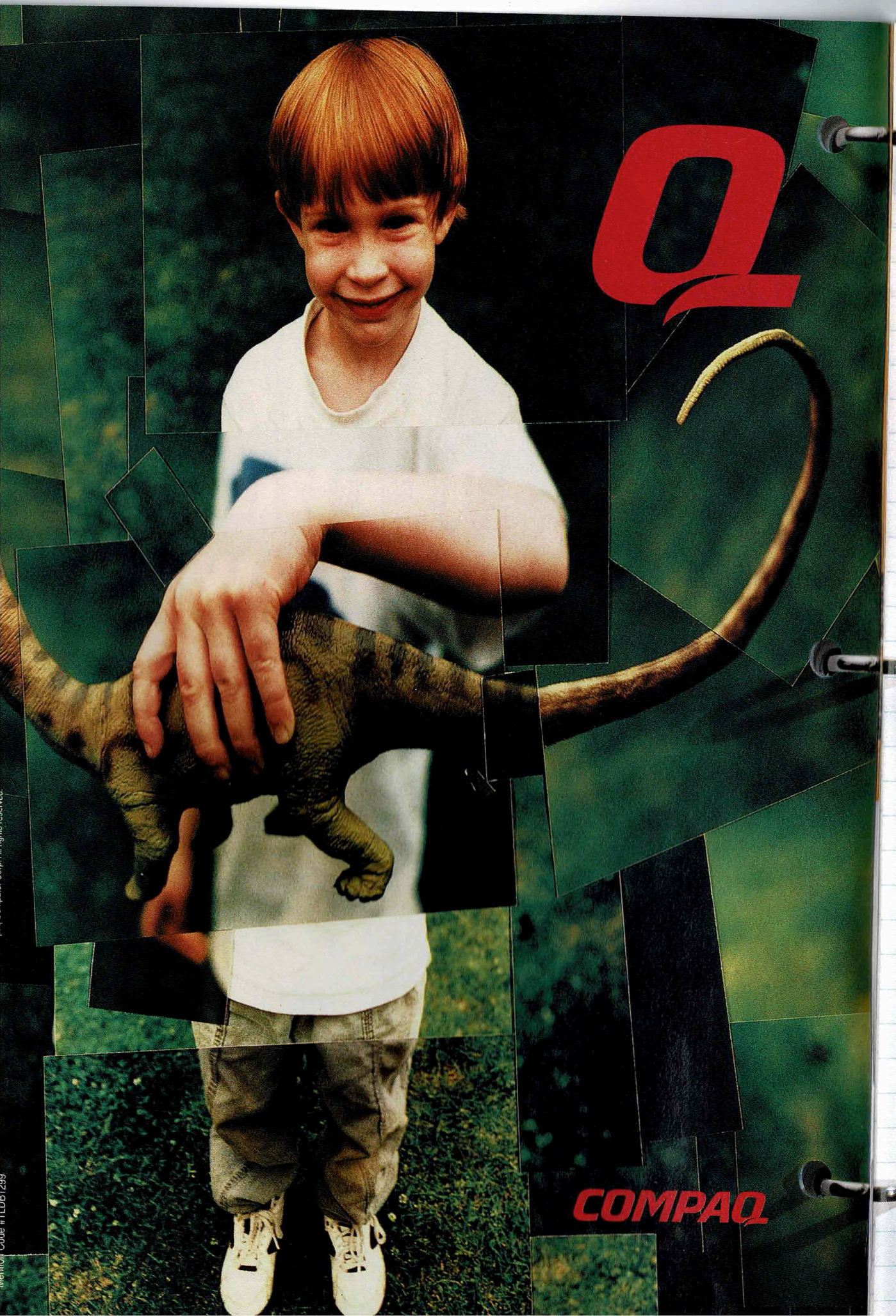
Watching Technology Grow Up

Special Issue

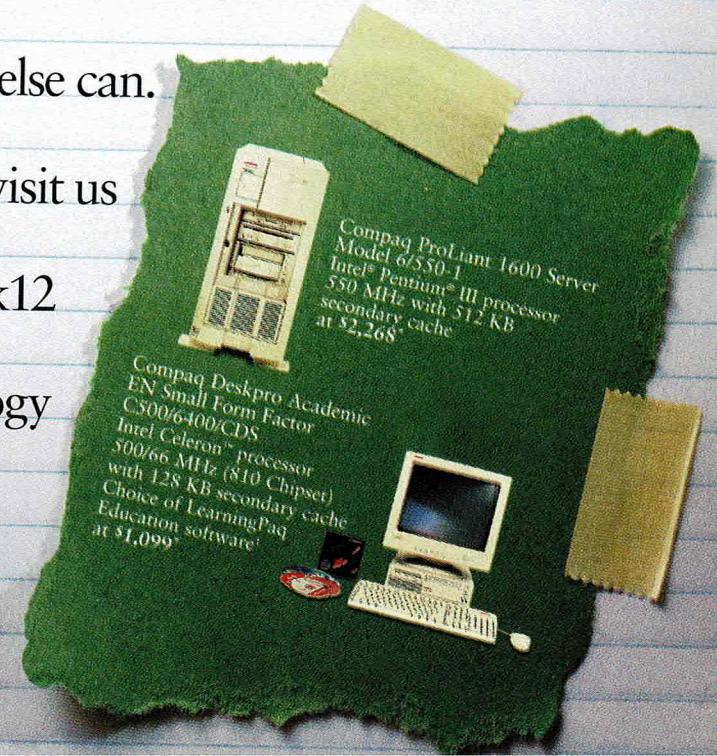


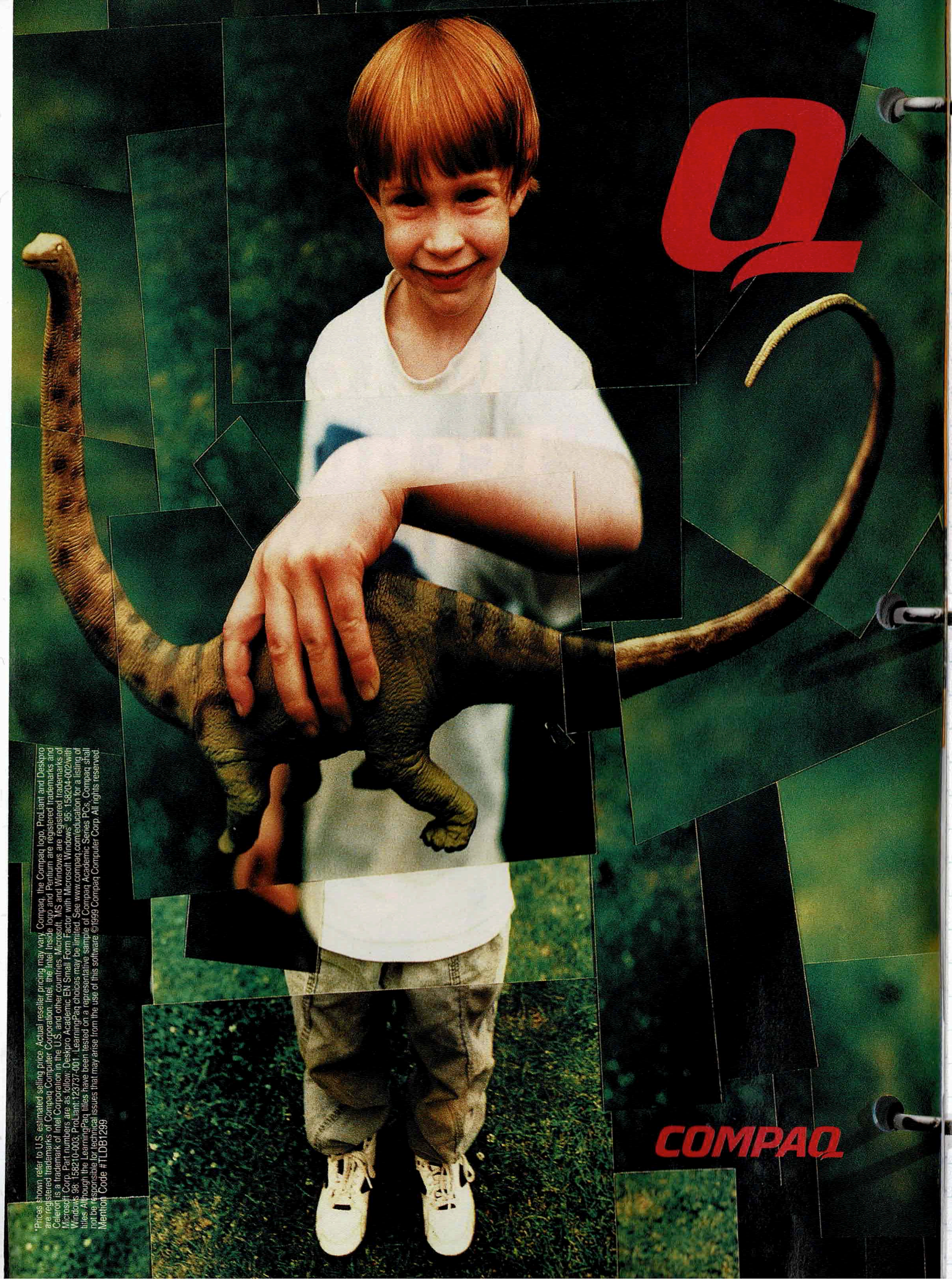
If technology is a teaching tool, what can it teach you about your students?

Who will become class president? Who will get into college? Who's destined to become a rock star? Can you imagine the day when technology can not only help you predict your students' success, but can actually help you build a better curriculum for them? It's closer than you think. As a leader in educational technology, Compaq is working on developing solutions right now that truly connect students, teachers and the community in ways no one else can.

So call 1-800-88-TEACH or visit us at compaq.com/education/k12 and discover what technology can teach you about your students and your school.

intel inside
pentium III





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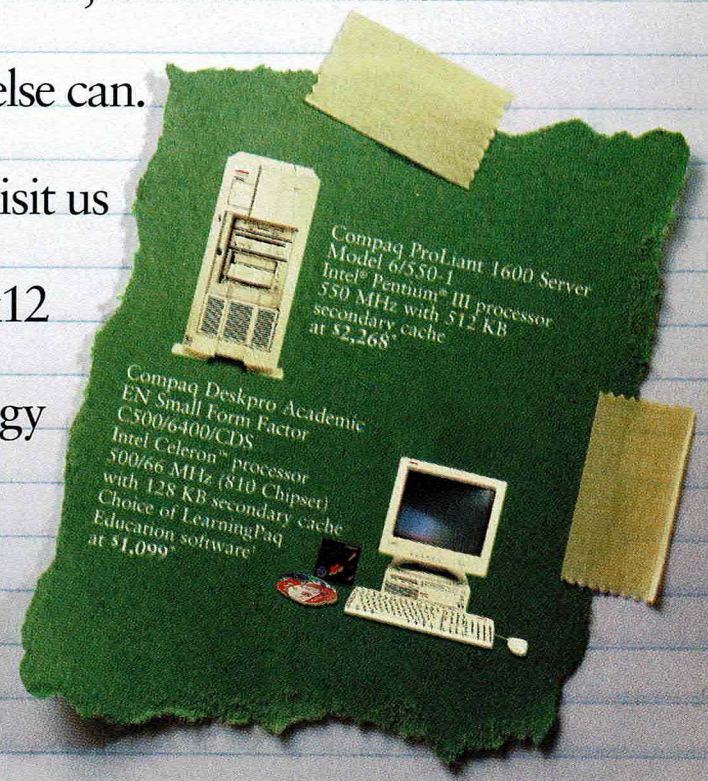

The Millennium Issue
December 1999

The hours spent researching and compiling this special millennium issue made some of us feel incredibly old (editor-in-chief Judy Salpeter was unnerved by the number of events from the past 20 years she remembered personally) and others unbelievably young (art director Michelle Andre couldn't conjure up a time when Apple Computer produced any computer other than the Macintosh). The number of artifacts, stories and future predictions sent our way by loyal readers and industry friends was mind-boggling. Our apologies ahead of time for the many good clips that hit the cutting room floor as we struggled to pack all your wise words and suggestions into the issue of a lifetime. At some point we had to stop ourselves from adding "just one last story" and concentrate on "putting the issue to bed." We hope you enjoy it.

7 **The Ed Tech Yearbook**
You lived through it but how well do you remember it? Come read the ultimate Technology & Learning class reunion yearbook, beginning with the Class of 1965. It will bring back memories that are 2good + 2B = 4gotten.

17 **Simply the Best**
In this compendium of "tops," we celebrate the products and people who've led the way, broken new ground, or shown us something we hadn't seen before.

27 **Bits and Bytes**
What wowed us? Surprised or disappointed us? Made us laugh, cringe, reflect, be on guard? Here, industry experts and our readers share advice, points of view, anecdotes, factoids—a bit of this and a byte of that.

57 **Turning Points**
Sometimes it's a defining moment; more often it's a gradual realization. In the stories that follow, students and educators describe how their lives—and the lives of people important to them—have been changed by computer technology.

71 **Coming Attractions**
From portals to "snortals," literati to digerati, wires to thin air, technological transformation waits for no one. In the following pages, tapped-in techies eye trends for the millennium and predict their impact on education.

85 **Pop Quiz**

88 **Century Timeline**

About the Contributors to This Issue

The authors and editors of the millennium articles include, in alphabetical order: Marilyn Berg Cooper, Susan McLester, Michael Milone, Margo Nanny, Amy Poftak, Rebekah Ramos, Judy Salpeter. Graphics for the issue were created by Michelle Andre and Carolyn Salgado, with statistics provided by Jeanne Hayes of QED. Several photos for the yearbook were obtained from the archives of the Computer Museum History Center (www.computerhistory.org), and others were provided by Karen Billings, Teri Perl and representatives of a number of companies.

In addition, numerous individuals contributed stories for Turning Points, were interviewed for the Coming Attractions section, or added tidbits to the Bits and Bytes collection. Many thanks to the industry "old timers" who attended our brainstorming meetings at the San Francisco Exploratorium and Atlantic City NECC conference or sent suggestions our way via e-mail. Finally, we are very grateful to all of you who took the time to fill out the millennium survey online at www.techlearning.com. We couldn't have done it without you!

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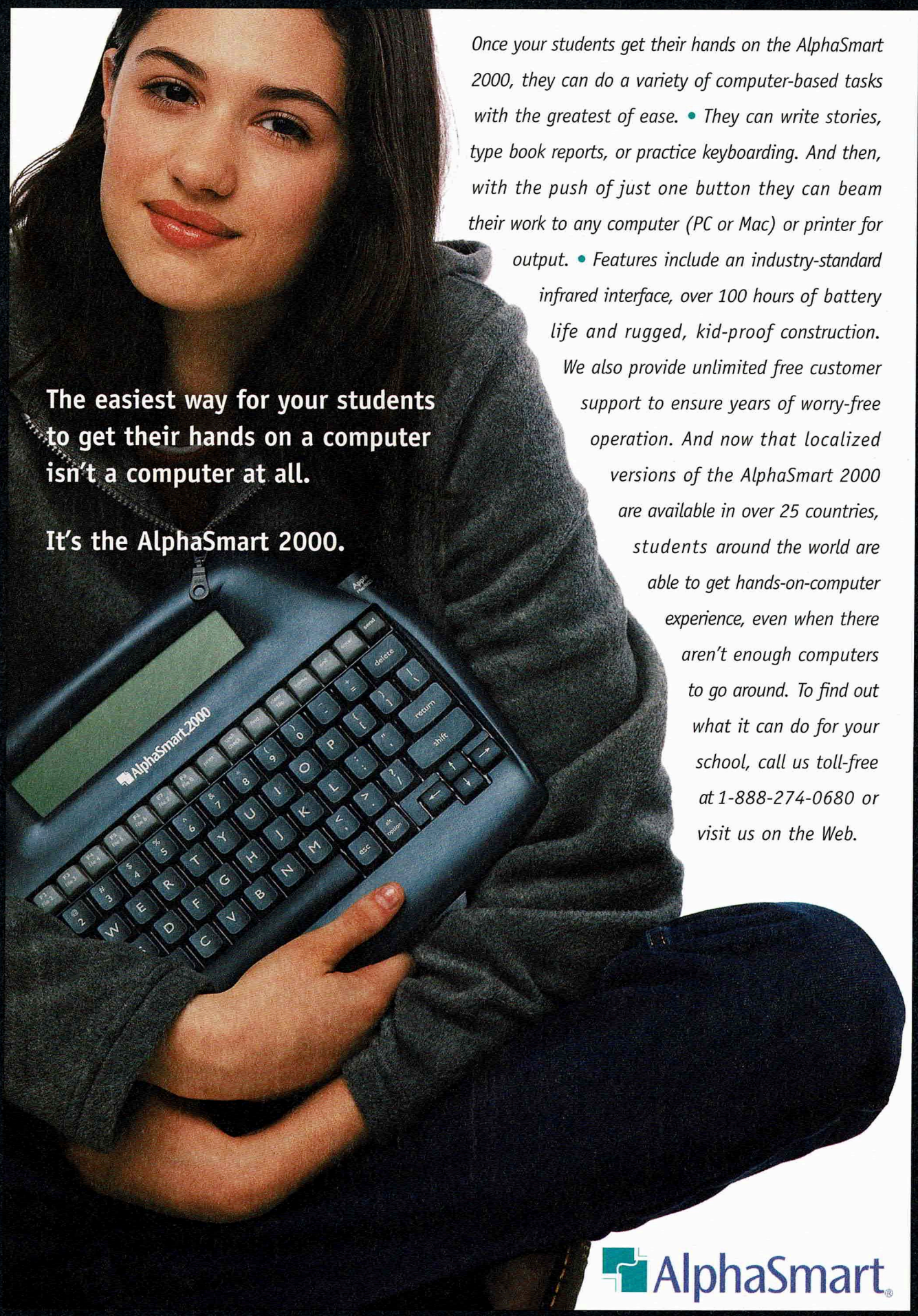
The easiest way for your students to get their hands on a computer isn't a computer at all.
It's the AlphaSmart 2000.
Once your students get their hands on the AlphaSmart 2000, they can do a variety of computer-based tasks with the greatest of ease. • They can write stories, type book reports, or practice keyboarding. And then, with the push of just one button they can beam their work to any computer (PC or Mac) or printer for output. • Features include an industry-standard infrared interface, over 100 hours of battery life and rugged, kid-proof construction. We also provide unlimited free customer support to ensure years of worry-free operation. And now that localized versions of the AlphaSmart 2000 are available in over 25 countries, students around the world are able to get hands-on-computer experience, even when there aren't enough computers to go around. To find out what it can do for your school, call us toll-free at 1-888-274-0680 or visit us on the Web.
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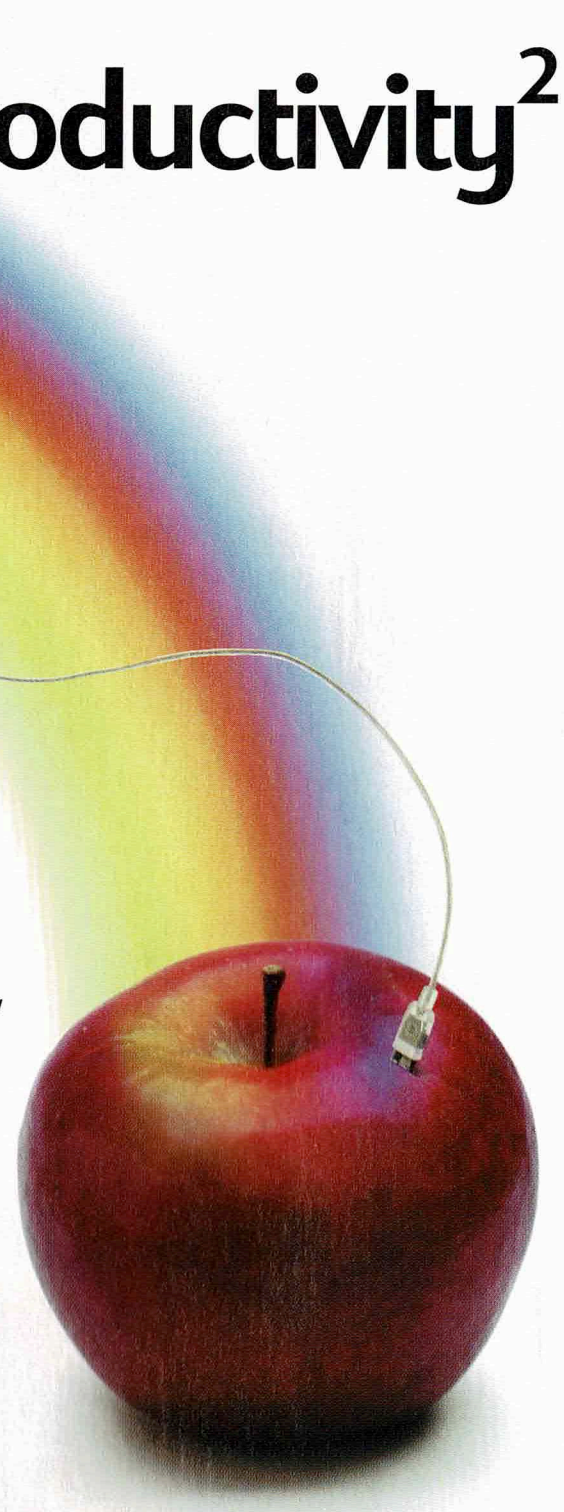
HP + Mac = Productivity^2

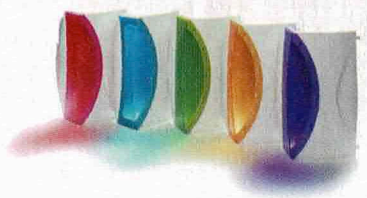


Hewlett-Packard will help you get an "A" in productivity, thanks to its new line of Mac Connect color printing solutions! These impressive new color printers connect quickly and easily to any USB-equipped MacIntosh computer—you'll be ready to go in mere seconds.

Hewlett-Packard DeskJet printers utilize PhotoREt Color Layering technology to deliver superior color print quality on any medium, including transparencies, card stock, plain paper, envelopes and more. Since they offer industry leading print speed, these printers can truly keep up with your imagination and creativity.

Hewlett-Packard printers also take up less space, and are very quiet—which makes them a perfect addition to any classroom or lab environment. Add the incredibly low cost of ownership and they're sure to be the new "teacher's pet."
For more information, visit **www.hp.com/go/mac-connect.**

HP offers "Mac Matching" printer lids— pick the one that's perfect for your classroom!*



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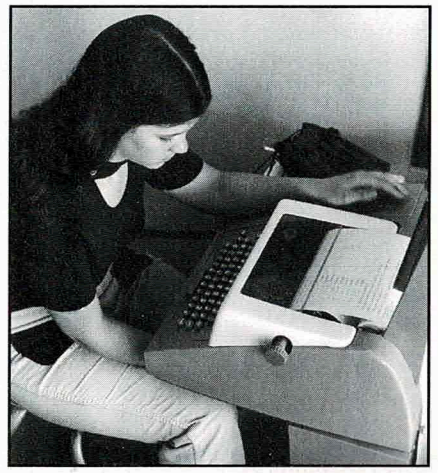
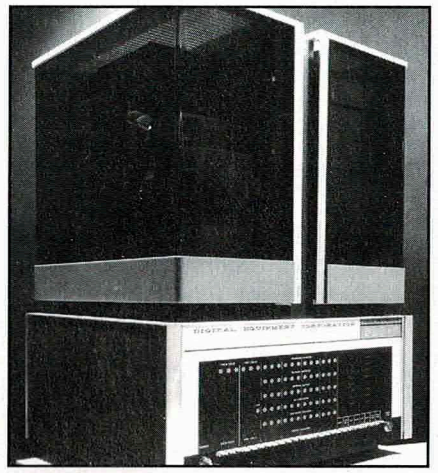
Ed Tech Yearbook

You lived through it but how well do you remember it? Come read the ultimate *Technology & Learning* class reunion yearbook, beginning with the Class of 1965. It will bring back memories that are 2good + 2B = 4gotten.

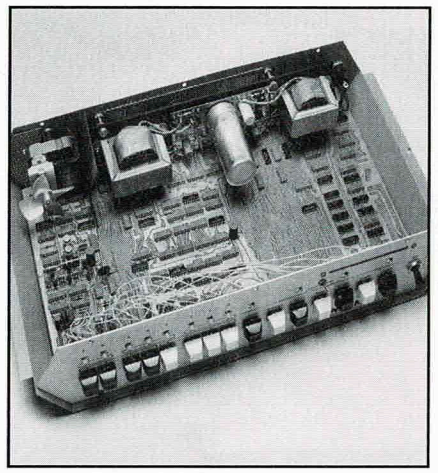
1965–1975



Most Forward-Thinking
The teletype machine broke new ground by allowing users to communicate in real time, via modem, with a mainframe computer. Who said telecommunications was a new idea?



Class Banterweight Champ
DEC's PDP-8 was the first successful "mini-computer." Before long DEC came up with a local timesharing system for it, allowing several students with teletype machines to access the computer at one time.



Least Likely to Be Remembered
According to the Computer Museum History Center, the 1971 Kenbak-1 was the first personal computer. It used switches for input and lights for output and it clearly was a few years ahead of its time; only 40 sold.

Buzzword: Time Sharing

Ahead to BASICs

"From 1962–1963 I was teaching FORTRAN programming to high school students in Denver with my friend Irwin Hoffman. It was not a good language for teaching but that's what we had. The students would type their programs onto punch cards and we would take them to a mainframe where we'd hand them to somebody behind a glass wall. A day later the students would get a printout full of error messages. They'd redo the cards and we'd repeat the process.

Then BASIC was invented at Dartmouth. They made it available on the Dartmouth Time Sharing system so it was possible to write and debug programs using teletype machines. I decided to go around the country and tell teachers about BASIC. When you had BASIC available, why bother with FORTRAN? I handed out cards and buttons for the 'Society to Help Abolish FORTRAN Teaching'—otherwise known as SHAFT."

— Bob Albrecht, crusader and co-founder (with LeRoy Finkel) of People's Computer Co.

Simulations: Episode One

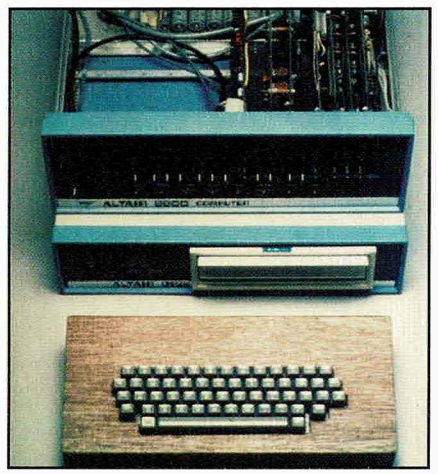
"Grandpa, is that you?"

Long before the "personal computer" made educational games popular in most schools, folks at the Minnesota Educational Computing Consortium (MECC) and elsewhere were building simulation games. *Oregon Trail*, for example, was created in 1971 as a senior project by Don Rawitsch and two other education students at Carleton College. Choices were input via teletype and the machine printed out the responses that came back over the phone line. Shooting was accomplished by asking the user to type "BANG" as fast as possible.

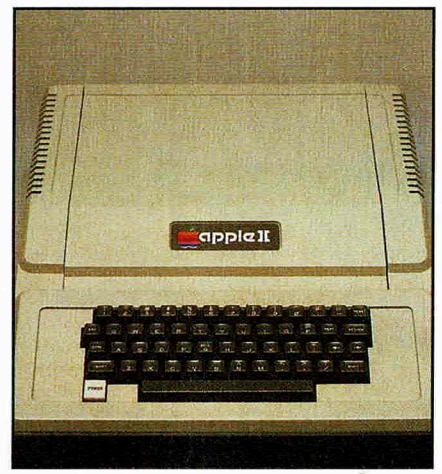
Other old-timers included the *Huntington Simulations* (see Turning Points, page 58), developed to work on the Dartmouth timeshare system, plus MECC's *Lemonade Stand* and *Odell Lake*. In 1979 and 1980, with help from Don Rawitsch, who had gone to work for the new consortium, MECC created Apple II versions of *Oregon Trail* and its other early simulations. As Rawitsch puts it, "*Oregon Trail* is now in its 12th version. Too bad we didn't know about royalties back when it started."

1965 — **PDP-8**
Federal funding for public television
Early version of **Logo** developed
Intel founded
ARPANET (Internet predecessor) developed for defense purposes
1970 — **Huntington Computer Simulations**
First version of ***Oregon Trail*** (timeshare)
People's Computer Center launches newsletter
Minnesota launches state consortium **(MECC)**
"Education for all Handicapped" Act (94-142)

1975–1980



Most Ambitious
The Altair 8800 personal computer kit (from MITS) was featured on the cover of *Popular Mechanics* in January 1975. It used a version of BASIC created by Bill Gates and Paul Allen. MITS was bombarded with orders.



Class President
Introduced in 1977, the Apple II was the first pre-assembled "micro." Competitors followed, but by 1979, when Minnesota adopted Apple IIs for the entire state, it was clear that Apple had moved into the No. 1 slot.

Runners-Up
Tandy's TRS-80 and Commodore's PET computer both shipped in 1977, shortly after the Apple II. The Atari 400 and TI-99/4 joined them soon after as rivals for educators' affections.

Hot: Microcomputers (later known as "personal" or "desktop" computers)

Your Grassroots Are Showing

The microcomputer craze that was hitting schools by 1980 was fueled by enthusiasm on the part of individual teachers who had read about the Altair or seen the new microcomputers in 1977 and decided to give them a try with their students. Sandy Wagner, then a high school math teacher in what later was to become California's Silicon Valley, was one of the enthusiasts. He started attending meetings of the brand-new Home Brew Computer Club and seeking other teachers with similar interests.

"I remember," says Wagner, "how alone we teachers felt. At Home Brew meetings and at the computer stores, we were among techies who didn't understand our lack of interest of the insides of the box. In 1978, I gave a talk on high school computing at the second West Coast Computer Faire and 300 people came. We decided to form our own group. That's how California Computer Using Educators (CUE) got started. In a few hectic years a grassroots group of teachers took the lead in developing conferences, "softswap" exchanges of homemade software and more. This scene was duplicated throughout the country during those heady times."

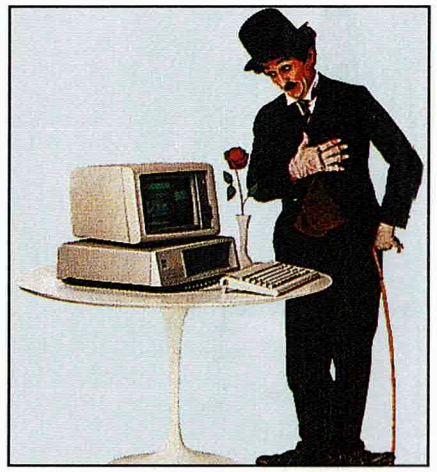
The first NECC conference, with its 32 sessions, took the movement national.

Remember When Floppy Disks Really Were Floppy?

It was the early move to incorporate 5.25-inch floppy disks (as opposed to saving programs onto standard audio cassette tapes) that helped win Apple the Minnesota bid. The first floppies held up to 400K of data. In time they moved to "double-sided" and eventually "high-density" versions that could hold as much as 1.25 megabytes (a little more than half as much as today's 3.5-inch versions with the "floppy" film protected inside a hard casing).

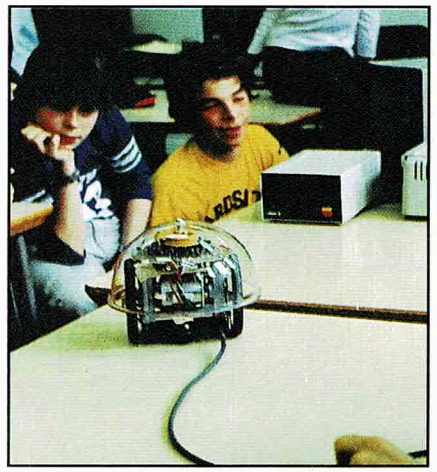
1975 — **Altair** personal computer kit announced
Apple I computer developed by Steve Wozniak
Commodore PET, TRS-80 and **Apple II** all ship
California CUE begins
First 5-1/4" floppy disks
VisiCalc turns the **Apple II** into a business machine
First NECC Conference
1980

1980–1985



New Kid on Campus

IBM entered the microcomputer world in 1981 with the "IBM Personal Computer" or PC. The PCjr, especially for schools, followed two years later.



Class Mascot

The Logo computing language, with its "turtle graphics," was a big hit. Versions with multiple turtles ("sprites") existed for the Atari and TI, and some lucky students even got to try out Logo commands on robotic turtles.

Most Popular

Playful early titles from The Learning Company, founded in 1980, focused on problem solving and exploration. Sunburst, MECC and Spinnaker were other key players in the world of problem-solving games.

Hot and New: Word Processing

The Drama Department Steals the Show

"Steve Jobs knew how to draw a crowd and hold it breathless, regardless of what he was announcing. By the time the Macintosh was introduced, his press conferences were so renowned that press members were actually scalping their tickets to the general public. After building up much anticipation about the new machine's architecture, Jobs dramatically connected a long cable to the back of a 128K Mac sitting alone on stage. The little Mac came to life and greeted the huge crowd in its robotic voice. 'Hello,' it said. People went wild!

For the Apple IIc, which was hot because it was so 'portable,' Apple employees were planted throughout the audience, with CPUs hidden under their jackets. At the cue, they all pulled the IIcs from under their coats, screamed and waved them madly in the air.

For the Apple IIGS intro two years later, Jobs had his techies create a flying saucer that took off from the Flint Center stage in Cupertino, flew around the auditorium, and landed back on stage. Don't ask what that had to do with the Apple IIGS, but it was pretty spectacular!"

— Holly Brady, former editor of T&L magazine (then known as Classroom Computer Learning)

A Record Year for the Debate Team

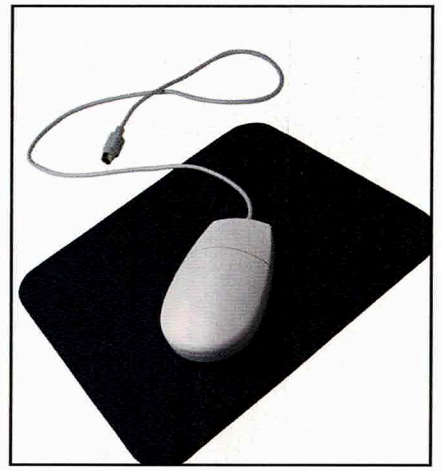
Tools vs. Instructional Software · BASIC vs. Logo · Drill vs. Problem Solving · ILS vs. Stand-Alone

The arguments could get pretty heated in those days. The FORTRAN/BASIC debate had given way to BASIC/Logo debates. Developers of the CCC, WICAT and Plato "Integrated Learning Systems" were passionate about their vision for transforming learning by providing students with a patient and all-knowing tutor. The simulation and problem-solving folks railed against the ILS approach, while Davidson's popular new *Math Blaster* focused attention on the pros and cons of drill. At the same time, Broderbund's *Print Shop* software, word processors including *Bank Street Writer* and *Magic Slate*, and integrated packages such as *AppleWorks*, were all taking the education world by storm—moving many to call for dropping the focus on instruction or programming in favor of real-world tools.

1980

- **Seymour Papert** publishes **Mindstorms**
- First hard-disk drives available
- **IBM** introduces the **PC**
- Osborne ships the first portable computer
- ***The Bank Street Writer*** ***Rocky's Boots*** ***The Factory*** — **Commodore** introduces the **C-64**
- ***Math Blaster*** ***Print Shop*** ***Writing to Read*** ***AppleWorks*** — **Kids Can't Wait:** Apple donates free computers to schools across California
- First version of **Microsoft Windows** announced
- ***Voyage of the Mimi*** mixed media project
- **Macintosh** debuts, followed by **Apple IIc**

1985–1990



Teacher's Pet

Introduced with the Mac in 1984, the mouse made its way into many schools attached to an Apple IIGS computer (class of 1986). Later that year, IBM and other PC manufacturers began incorporating it into their machines.

Most Focused on Life Beyond High School

Tandy/Radio Shack led the charge to convince schools to abandon the Apple II platform in favor of tools to prepare students for their future (i.e., MS-DOS).

Most Likely to Turn Heads

Most schools with an interest in multimedia had invested in at least a few videodisc players. The spotlight on videodiscs intensified when Texas voted to allow videodisc-based courses to compete for "textbook" adoption money.

Favorite Acronyms: GUI, WYSIWYG

Singing the Customer Service Blues

The multitude of options available in the late 1980s was enough to keep customer service departments at the software and hardware companies hopping. Monitors came in many different resolutions, printers were far from standardized and schools tended to have an array of incompatible computers including Commodore 64s, the ever-popular Apple II, and the newer Macs, Commodore Amigas and PCs. Computer users were transitioning from 5.25-inch to 3.5-inch floppies, with videodiscs as an optional peripheral and the first CD-ROM drives hitting the market by the end of the decade. Some DOS users had mice, while others were still using the keyboard for input.

Customer service reps shared amusing stories to keep themselves sane. A hardware company reported a call from a woman who, after placing her new mouse on the floor and attempting to operate the computer in this manner, phoned customer service to say she couldn't get the foot pedal to work. Marylyn Rosenblum, a long-time educational software marketer who worked at Grolier in the earliest days of CD-ROM (when even a speck of dirt or a hair could prevent the drive from reading the disc), reported a call from an educator who assured them she had cleaned the malfunctioning CD thoroughly—with Brillo.

Apple II Forever?

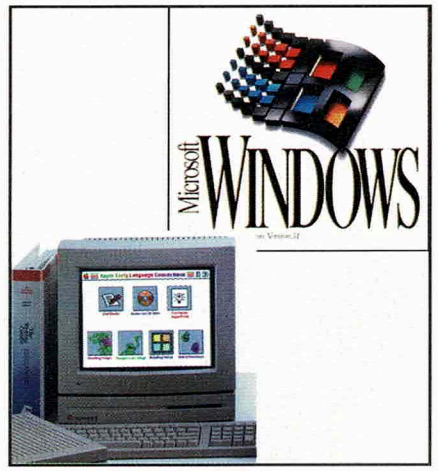
The "Apple II Forever" theme song, rendered with much gusto at the IIc rollout in 1984, was beginning to sound a little tinny as the decade wore on. The Apple IIGS computer did OK in schools at first but began to run into trouble when developers tried, unsuccessfully, to emulate Macintosh productivity on the less powerful platform. (In fact, several companies put themselves out of business in the attempt.) While Apple argued internally about when to lift the "embargo" on Macintosh sales efforts to K–12 schools, IBM and Tandy grabbed significant market share. By 1990, Apple had changed its tune entirely—announcing a line of Macintosh computers specifically for schools. To appease the Apple II enthusiasts, the LC shipped with an optional Apple II emulator board, although we don't know of all that many schools that embraced the emulator in any big way.

1985

- ***Reader Rabbit*** — **Atari ST** and **Commodore Amiga**
- **Apple IIGS** announced
- **Grolier's** ships **CD-ROM** text-only encyclopedia
- **Talking Textwriter** brings speech to word processors
- **IBM** introduces **PS/2** computers — October declared **Computer Learning Month**
- **HyperCard** — **OTA Report** on the state of technology in schools
- **Star Schools** program begins — Texas permits electronic products for textbook adoption
- **Channel One** launched, causing controversy over advertising in schools — First **HyperStudio**

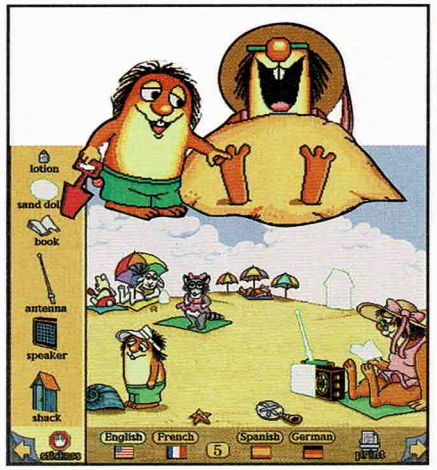
1990

1990–1995



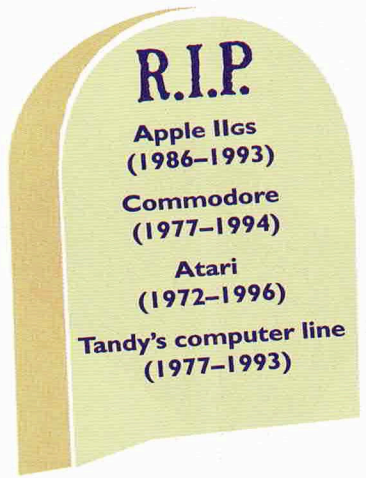
Homecoming King and Queen

Nobody said the king and queen had to be good friends, right? As Windows 3.0 and 3.1 gained popularity in schools, Apple was making headway with its Mac LC line.



The One to Follow

Just Grandma and Me, the first title in the Living Books series, wasn't the first CD-ROM storybook; Discis books preceded it. But Grandma and Little Critter quickly stole the stage, inspiring many imitators.



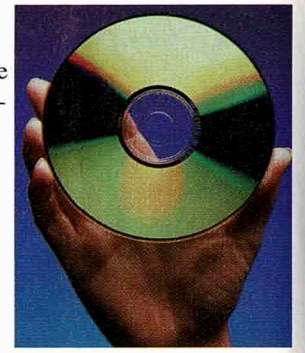
Lost to the Wars

It was a tough few years for microcomputer pioneers. By 1995 Apple Computer was the only of the pre-1980 micro manufacturers still in the computer business.

Buzzwords: "Edutainment" and "Restructuring Education"

Interactive Multimedia Takes Center Stage

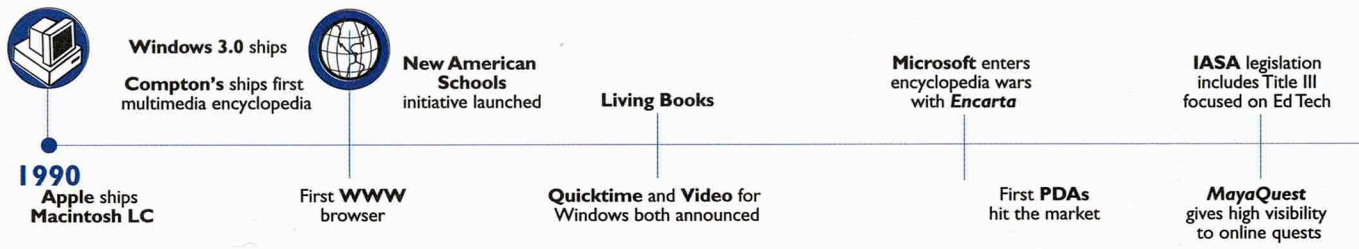
In the early 1990s the education world was buzzing with multimedia talk. On the do-it-yourself front, *HyperCard* (class of 1987) and *HyperStudio* (class of 1989) were being used enthusiastically by many Apple IIGS and Macintosh schools, while IBM's Linkway and other short-lived competitors tried to make similar inroads into the DOS/Windows world. Computer-controlled videodisc programs from Videodiscovery, Optical Data and Decision Development were making headway on the textbook adoption front, and IBM was dazzling educators with demonstrations of *Columbus* and *Illuminated Manuscripts*—multi-faceted programs that took the videodisc technology to new heights. In the meantime, Apple had founded the Multimedia Lab, which, by the time it shut its doors in 1992, had aided in the creation of such inspiring programs as *Visual Almanac*, *Interactive NOVA* and *GTV*.



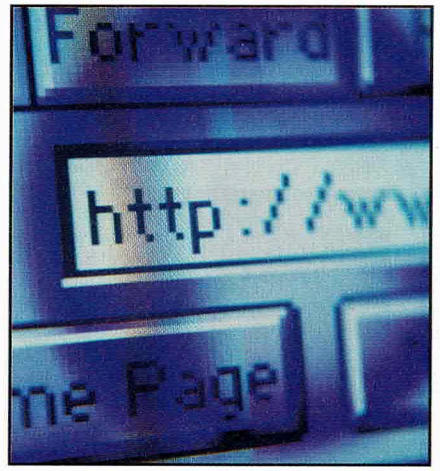
As the medium of choice shifted from videodisc to CD-ROM. there was a race to see whose "standard" would be adopted. Philips' CD-I, Commodore's CD-TV and Electronic Arts' 3-DO were casualties, while the built-in multimedia of the Macintosh and the "MPC" standard championed by Microsoft won the day.

Heading for the Information Superhighway

Along with the government and university community, K–12 schools were some of the earliest and most enthusiastic users of the now-public Internet. In the days preceding the World Wide Web, proprietary telecommunications services, including Scholastic Network, Classroom Prodigy, Compuserve and AOL, brought schools e-mail and an online community with which to interact.


1990
Apple ships Macintosh LC
Windows 3.0 ships
Compton's ships first multimedia encyclopedia
First WWW browser
New American Schools initiative launched
Quicktime and Video for Windows both announced
Living Books
First PDAs hit the market
Microsoft enters encyclopedia wars with Encarta
MayaQuest gives high visibility to online quests
IASA legislation includes Title III focused on Ed Tech

1995–2000

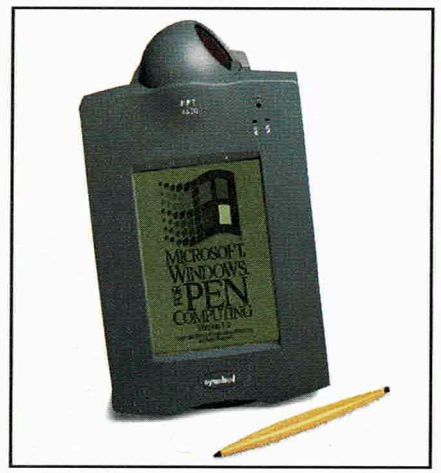


Most Likely to Succeed—Big Time!

Within a few years of its debut, the World Wide Web is everybody's darling—especially in schools where telecommunications fever has already taken hold.

Most Resilient

While Apple is no longer the only kid on campus, rumors of its death were clearly premature. Some schools feel jilted by the quick departure of the eMate, but many more greet the new iMacs with enthusiasm.



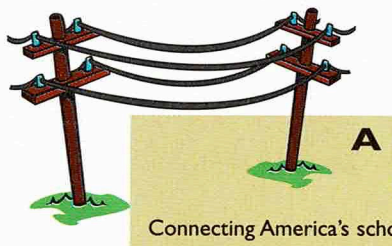
Least Interested in Growing Up

In the digital world, smaller is definitely better these days, as word processing devices, ever-lighter notebook computers, PalmPilots and other PDAs make their way into classrooms, homes and administrative offices.

Top 10 Things to Worry About

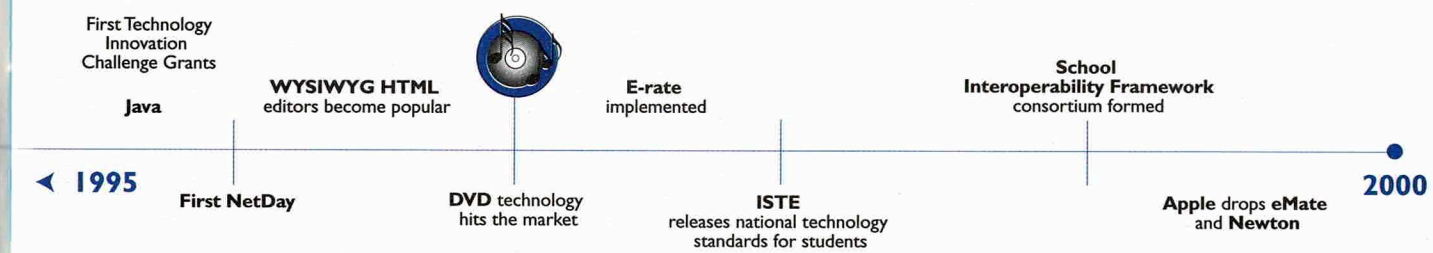
1. Building the Infrastructure
2. The Digital Divide Created Along the Way
3. Internet Safety
4. How to Assess Progress
5. Dealing With the "Backlash"
6. Integrating the Technology
7. Teacher Training
8. Copyright Issues
9. Who's Going to Pay for It All?
10. How Long Before There's Only One Software Company Left?

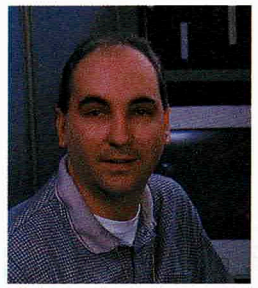
What's Hot: E-everything



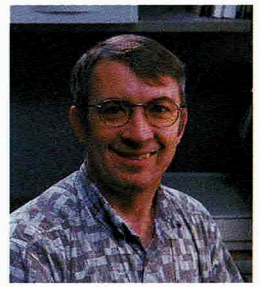
A Chicken in Every Pot, a Wire in Every Wall

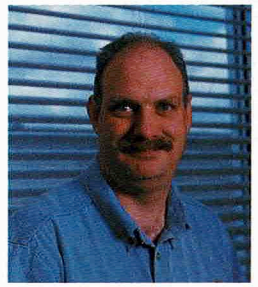
Connecting America's schools to the information highway becomes a national passion—and pastime. NetDay events (class of '96) involve community members in wiring classrooms and schools. The E-rate (class of '97) offers discounts to schools on telecommunications services.

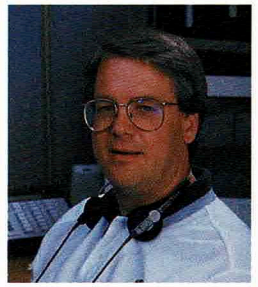



Jody

Shannon


Bill


Jim


Dave

D'Yon

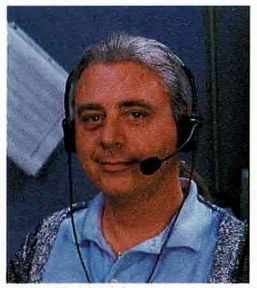
Barb

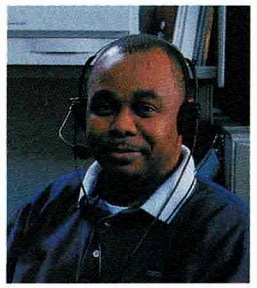
Woody

Keith

Joe

Mary


Marlin


James

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- 3.5" Diskette Drive
- Integrated Intel 10/100 Ethernet with Wake-up On LAN
- Integrated Business Audio
- 3-Bay Highly Serviceable Convertible Case
- 104+ Keyboard
- Microsoft® IntelliMouse® & Mouse Pad
- Microsoft Windows® 98
- Intel LANDesk® Client Manager
- 3-Year Limited Parts Warranty w/3-Year On-site Service[2]

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- 128MB 100MHz SDRAM
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- 6.8GB S.M.A.R.T. II Ultra ATA Hard Drive
- 17X min/40X max CD-ROM Drive
- 3.5" Diskette Drive
- Integrated 3Com® 10/100 Ethernet with Wake-up On LAN
- Integrated Business Audio
- 5-Bay Highly Serviceable Convertible Case
- 104+ Keyboard
- Microsoft IntelliMouse & Mouse Pad
- MS Windows 98
- Intel LANDesk Client Manager
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- 4MB Graphics Accelerator 2X AGP
- Integrated 10X min/24X max CD-ROM Drive
- Integrated 3.5" Diskette Drive
- 4GB Ultra ATA Hard Drive
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- USB Ports, Serial and Parallel
- Integrated 16-Bit Sound & Stereo Speakers
- Integrated V.90 Modem
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- Integrated 3.5" Diskette Drive
- 4GB Ultra ATA Hard Drive
- Lithium Ion Battery & AC Pack
- USB Ports, Serial & Parallel
- Integrated 16-Bit Sound & Stereo Speakers
- Integrated V.90 Modem
- EZ Pad Pointing Device
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- 32-Bit PCI Graphics with 2MB DRAM
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- FCC Class A Emission Standard[3]

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ALR 8200 Department Server

- Intel Pentium III Processor 450MHz with 512K ECC Cache
- SMP-Compliant Supporting up to Two Pentium III Processors
- 128MB of PC100 ECC SDRAM (expandable to 1GB)
- 9GB Ultra 2 SCSI 7200 RPM SCA Hard Drive (expandable to 324GB)
- 17X min/40X max IDE CD-ROM Drive
- 3.5" Diskette Drive
- Integrated Intel 10/100 Twisted Pair Ethernet Adapter
- Four DIMM Slots
- Six PCI, One ISA & One PCI/ISA Slot
- 32-Bit PCI Graphics with 2MB DRAM
- 13-Bay Server Tower Case with Optional Dual 400W Redundant Power Supplies, Includes Seven External Bays (Five 5.25" & Two 3.5") & Six 3.5" SCA Bays (requires SCA drives)
- InforManager Server Management System
- 3-Year Parts Limited Warranty w/3-Year On-site Service[2]
- FCC Class A Emission Standard[3]

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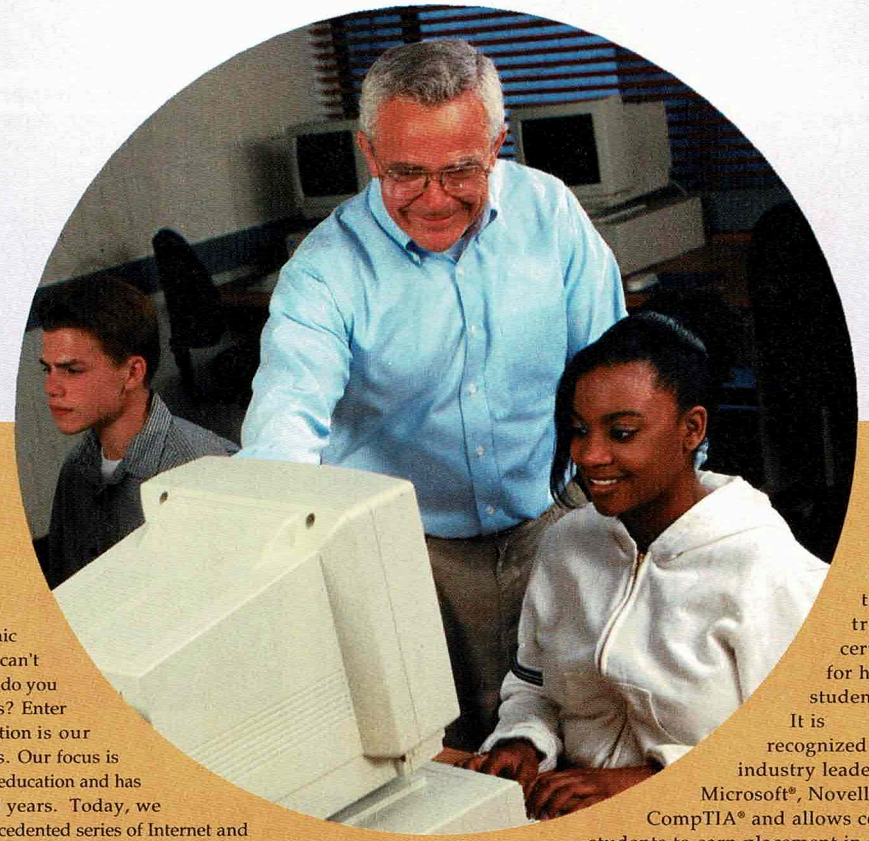

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Honoring the Nation's Best: Meet T&L's 1999 Teachers of the Year

Sponsored by:
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National Winner: Tim Comolli

So. Burlington High School, So. Burlington, VT

The 1999 National Teacher of the Year took an unusual path to becoming a technology specialist. At the age of 11, Tim Comolli found himself on the cover of *Billboard* magazine as the youngest disc jockey in America. Years later, as an English teacher at South Burlington High School in Vermont, his radio experience made him the logical choice to be the school's audio and film instructor. A technophobe at first, Comolli slowly migrated to computers as they became more common in education. Today, this self-effacing teacher runs the Imaging Lab, one of the most advanced technology installations in the country.

The Imaging Lab at South Burlington began about five years ago with decidedly low-tech equipment. "My students did some video editing that I thought was pretty good, but I didn't feel I was enough of an expert in the area to make an informed decision. I invited the president of a local video production house to drop by and see what the kids had done. He was so impressed that he donated a $5,000 computer so the students could really show their stuff."

From this small beginning, the lab has grown into a nationally recognized facility that has been featured in *The American School Board Journal* as well as several books that focus on exemplary technology programs. Comolli's students are accepted at some of America's top universities, and he has obtained grants from Microsoft, Digital Equipment Corporation, and the Henderson Foundation.

To understand the impact of the lab and this outstanding teacher, consider this example. One of Comolli's former students recently graduated from college. Based on many of the skills the student learned at the lab, he was offered a job with a major television network at a starting salary of $50,000, plus a signing bonus.

The Imaging Lab has a waiting list of students eager to join the program, and its reputation has grown so that it has become a community resource. Comolli and his students teach courses for art teachers from other schools within the district, as well as from other districts, and they offer evening classes for adults from the community. They have also established a partnership with Kanazawa Technical College, located halfway around the world in Japan. It's a pretty amazing story for a relatively small high school in rural Vermont.

The "mushroom people," as the lab students are known by their peers, are an unlikely lot. Some have been top students throughout their academic career. Others have been saved by the lab. One of the most impressive stories is that of JR, a troubled student from an even more troubled family. "JR was so violent that he required almost constant supervision," explains Comolli, "and seemed to be destined to the same fate as his father, a lifetime in prison." A chance encounter brought JR to the Imaging Lab and he was hooked. Soon, his grades improved, as did his attitude, and within months, he was among the stars of the lab. He was asked to present his work at the New Jersey Education Summit and has continued on to post-secondary education.

Although Comolli has achieved remarkable results in the past, his greatest challenge lies ahead. "Vermont has passed an equal funding law that will distribute state education monies differently," says Comolli. "This will result in significant cuts to South Burlington and the Imaging Lab." Instead of letting this get him down, Comolli and his colleagues are already laying the groundwork for making South Burlington a magnet school, including offering courses through a local two-year college and doing contract work for regional businesses. This can-do attitude, combined with his dedication to his students, is what makes Comolli a leader in his field.

Photos by Glenn Russell

Regional Winner: Michael Hutchison

Lincoln High School, Vincennes, IN

Vincennes is a quiet town of 20,000 not far from the Wabash River in southwestern Indiana. The town doesn't have much industry, its farms are small and family-owned, and all things considered, it's a typical Midwestern community. A distinctive feature of the town, however, is the world-class education its students receive at Lincoln High School, thanks in great part to social studies teacher Michael Hutchison. Through his efforts, his students now see the broad horizons open to them and consider technology a stepping-stone to successful careers or continuing education.

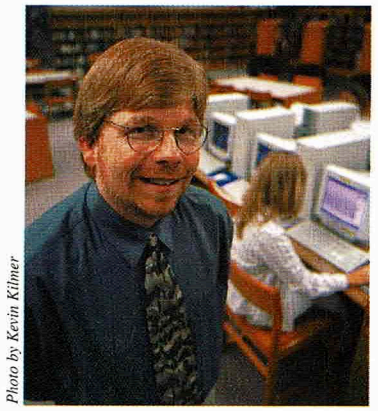


Photo by Kevin Kilmer

Since 1995, Hutchison's students have participated in electronic field trips that take them all over the world. They've learned about V-E Day, Ellis Island, and the United Nations. During these trips, they combine their digital experiences with activities such as preparing ethnic luncheons, holding a Model United Nations meeting, and interviewing politicians.

Hutchison doesn't see the use of technology as "spoon-feeding" students. "For each of the activities in which my students engage, I raise the bar a little higher than it was during the last activity. They are responsible in great part for what they learn, and they take this responsibility seriously, performing well beyond my expectations."

One project in which Hutchison's students have been involved is Online Class's The North American Quilt: A Living Geography Project, which requires students to research their local area, take field trips, talk to experts, and post their work online.

In addition to his teaching responsibilities, Hutchison works as public relations editor for ED's Oasis, is a member of the Tapped In resource for teachers, and serves as a technology associate for the Indiana Department of Education. Recently, he was named to the advisory panel of online resource SchoolCity.

Regional Winner: Shannon McCoy

Jenks Southeast Elementary, Jenks, OK

The month before students enter Shannon McCoy's second-grade classroom, they receive a letter at home inviting them to visit the class Web site, where they can learn what awaits them during the upcoming year. "It's amazing how well both the children and parents respond to the welcoming letter," suggests McCoy. "It gets them hooked on technology and helps build a great relationship among the students, parents, and me."

This relationship has allowed McCoy to create a technology-rich classroom that meets all her students' learning needs while preparing them for the challenges that lie ahead. It's a powerful blend of e-mail, online research, the writing process, and just plain "kid's stuff."

On a typical day, McCoy's students check their e-mail, send online weather information to keypals in Wisconsin and perhaps work on the class newspaper or create multimedia presentations.

When asked how McCoy manages to keep such young students productively occupied with so many learning options, she replies, "Procedure, procedure, procedure…. I spend the first few weeks helping students become accustomed to our daily routine. Each day, I work with a different group of students, teaching them about a relatively small group of related activities. After a week, these groups can teach the other students, so within a week or two, students know what's expected of them, how they can meet these expectations, and how they can get help when they need it. The parents love the way the kids work independently yet meet everyone's learning expectations."

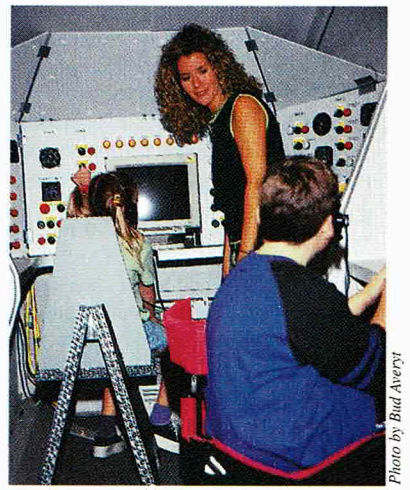


Photo by Bud Averyt

McCoy has created lesson plans for the Aurora Project and also contributes to the National Educational Technology Standards Writing Project. It's little wonder that her students and their parents, her peers, and her district administrators speak so highly of her.

Regional Winner: Judith Russell

La Entrada School, Menlo Park, CA

Being chosen as a regional Teacher of the Year is almost embarrassing to Judy Russell. "I have to share this recognition with my colleagues, the parents of my students, and our community," she confesses. "They've made my job easy." That may be so, but someone has to do the heavy lifting, and it's pretty clear that Russell does more than her share.

Although she considers herself a novice teacher with just five years of experience, Russell has two careers behind her. As a legal secretary and an events coordinator, she learned the importance of time management, a skill she transferred to the classroom. "A casual observer might think that the students are doing their own thing, but they are not," she asserts. "I emphasize the basics as well as independent work, and my students know how important it is to use their time effectively." As evidence of her success, 12 of her students are on the school Tech Team, and all have achieved honors.

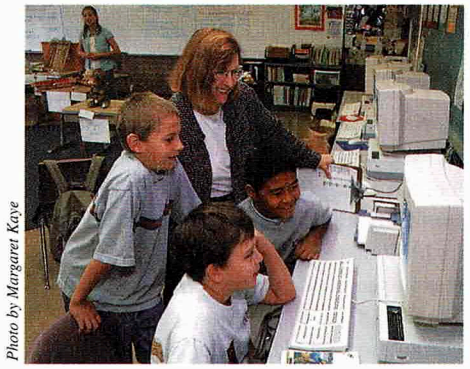


Photo by Margaret Kaye

Like many great teachers, Russell constantly challenges her students while instilling in them the willingness to take risks. She manages to blend technology with hands-on learning that reflects students' interests, abilities, and learning styles. After studying ancient Egypt through traditional and electronic resources, she has her students participate in a variety of Egyptian experiences, including mummifying a Cornish hen. The process is recorded on a digital camera and the electronic images become part of a slide show documenting the event.

Many of her students come from advantaged homes, but Russell makes sure that all students have access to the technology they need. The computer lab has convenient hours, and any student who needs extra help gets it.

The support of the local and extended communities has contributed greatly to Russell's success. "We have an enormous advantage because we are in the heart of Silicon Valley. Parents and community members are eager to volunteer, and I have no hesitation about recruiting them. When I wanted my students to learn how to use some imaging software, I was able to call on one of the programmers who developed the software to give us a demonstration and training. That's just one example of the kind of support we have."

Semi-Finalists

Joy Bennett
Gingerich Elementary
Stuttgart, Arkansas

Brenda Bleigh
Burnsville Elementary School
Burnsville, West Virginia

Diane Boarman
Patapsco Middle School
Elliot City, Maryland

Al Bode
Charles City High School
Charles City, Iowa

Sherry H. Buchanan
Merimack Year Round Elem.
Hampton, Virginia

Robert M. Caplan
Tapp Middle School
Powder Springs, Georgia

Karen Cohen
Montgomery High School
Skillman, New Jersey

Catharine H. Colwell
Mainland High School
Daytona Beach, Florida

David Fair
Unalakleet Schools
Unalakleet, Alaska

Monica L. Folse
Estelle Elementary
Marrero, Louisiana

Joan Gil
Canutillo ISD
Canutillo, Texas

Alan Griffin
Weber School District Office
Ogden, Utah

Linda E. Hains
Rock Hill High School
Rock Hill, South Carolina

Irene Huschak
Altoona Area High School
Altoona, Pennsylvania

Sharon Karpen
Sonoran Sky Elementary
Scottsdale, Arizona

Rebecca Kelly
Delmar Jr./Sr. High School
Delmar, Delaware

Lia Landrum
South Jones High School
Ellisville, Mississippi

Barbara Leonard
Alma Middle School
Alma, Michigan

Jean Lowery
Bishop Woods Elementary
New Haven, Connecticut

Brenda Lynch
Madison High School
Madison, South Dakota

John Joseph Mertes
Rhodes School District 84.5
River Grove, Illinois

Katie E. Morrow
Stuart Public
Stuart, Nebraska

Shirley A. Newton
Westerville North High School
Westerville, Ohio

Betsy Norris
Harris Middle School
Shelbyville, Tennessee

Darlene Ryan
Perry Harrison School
Pittsboro, North Carolina

Teresa M. Sarno
Ramstein American Elem.
Germany, U.S. Schools Abroad

Mary Sippel
Newfane Elementary
Newfane, New York

Pam Solvie
Morris Area Elem. School
Morris, Minnesota

Linda Sorenson
Holmen Middle School
Holmen, Wisconsin

Barry G. Sprague
Park View Elementary School
Washington, D.C.

Maurene Stapel
Auburn School District
Auburn, Washington

Linda J. Thompson
Clark County School District
Las Vegas, Nevada

David Walker
Tonganoxie High School
Tonganoxie, Kansas

Rosalyn Weizer
Gilbert H.Hood Middle School
Derry, New Hampshire

Lisa A. Zavota
Curvin McCabe
Pawtucket, Rhode Island

Teresa D. Zimmer
Carlisle Park Middle School
Guntersville, Alabama

Teachers of the Year Update

At *Technology & Learning*, one of the most rewarding parts of the job is getting to know great people. Among our favorites are our Teachers of the Year. We do our best to stay in touch with them, and we thought you might like to know what they're doing now.

Randy Allen (1988, Ohio) is the director of technology for Gahanna-Jefferson Public Schools. He also teaches graduate-level technology classes at the Columbus branch of Ashland University and was appointed to the Ohio SchoolNet Commission.

Rita Beard (1989, South Carolina) continues to teach and is a past winner of South Carolina's business education Teacher of the Year award. She's also on the technology committee for her district, has been active in state technology conferences, and has judged a number of technology competitions for students and teachers.

Lynn Regan (1990, New Jersey) continues to teach special education. She was nominated for the Computer World/Smithsonian Technology Leadership Award in Education and helped to develop curriculum for the U.S. Department of Special Education and Rehabilitative Services. She has presented for IBM at several administrator conferences and is a consultant for The Learning Company.

Dave Master (1991, California) was discovered by Hollywood—no lie! He has been director of artist development for Warner Brothers Animation for more than five years, and has initiated an exciting distance learning network that broadcasts to six schools on a weekly basis. He recently spoke at the International Conference on Arts Education in New York, and was named winner of the June Foray Award from the International Animated Film Society for "significant and benevolent impact toward the art and craft of animation."

Bill Burrall (1992, West Virginia) is teaching ninth-grade computer and technology literacy at Moundsville Junior High School in Marshall County, West Virginia. He received the Ashland Oil Teacher Achievement Award in 1994 and a Christa McAuliffe Fellowship in 1995. He serves in an advisory capacity for several publications and organizations and has created several collaborative learning projects. Bill also lends his services as an information specialist for AT&T's Learning Network.

Chuck Drake (1993, Virginia) was recently recruited as the technology coordinator for a new high school in construction and due to open next fall. His job will be to design and develop a one-of-a-kind technology program in the state. Several years ago, he was named a Tandy Technology Scholar and awarded a Gift Fellowship by GTE. He is also the state technology coordinator for Microsoft.

Sandy Cangelosi (1994, Texas) has done a good deal of work within her state, speaking at technology meetings and workshops, and serving on several committees of the Texas Computer Education Association. In addition to her national award, she was recognized as the state technology Teacher of the Year.

Winnie Bolinsky(1995, Pennsylvania) still teaches fifth grade and recently started working on her doctorate through Curtin University of Technology SMEC (Science & Mathematics Education Centre) out of Perth, Australia. Last spring, she received the Sheldon Equipment and Facilities Award from the National Science Teachers Association, and in 1996, was a recipient of a Milken Family Foundation National Educator Award.

Caroline McCullen (1996, North Carolina) is an instructional technologist at SAS inSchool, the K–12 Education Division of SAS Institute. She serves on the National Technology Expert Panel for the Department of Education and writes a technology column for *Middle Ground*, the national middle school journal. She continues to work with *MidLink* magazine and is on the board of HyperSIG, ISTE's Special Interest Group for Multimedia.

Lucy Miller (1997, North Carolina) was the education director for SchooLife.Net and still serves as the director of the SWAT (Students Working to Advance Technology) program. She was inducted into the Rhode Island College Hall of Fame, and also received the Individual Award for Education by the North Carolina Educational Technology Association. Lucy was recently named manager for school communities for a new education portal sponsored by Bell & Howell and Infonautics.

Florence McGinn (1998, New Jersey) and her students have presented at the IBM Executive Conference Center, at universities, for in-service days, and for administrators and groups from Korea, Singapore, and all over the United States. Through videoconferencing, they recently interviewed Chinese poet Ke Yan, whose poems were translated for publication in *Electric Soup,* the school's online literary magazine.

About the Awards Program

Now in its twelfth year, the *Technology & Learning* Teacher of the Year program, sponsored by The Learning Company, recognizes K–12 teachers who use technology to create innovative learning environments.

A panel of judges chose state finalists based on a three-page statement from each entrant. State winners received *The Print Shop* and *Road Adventures* from The Learning Company and a one-year subscription to *Technology & Learning*.

From the state winners, four regional finalists were chosen. In addition to the state prizes, each received two Compaq multimedia notebook computers—one for school and one for home—plus a library of software from The Learning Company. Regional winners were also given free travel, lodging, and registration for the NSBA T+L Conference in Dallas.

Our national winner, selected from the regional winners, received additional software from The Learning Company.

Better Than Best

For the past 17 years, we at *Technology & Learning* have been honoring the best in educational software titles through our annual Software Awards of Excellence program. In 1985, we began making the distinction between Regular Award Winners and Top Winners. The following list of Top Winners, judged "groundbreaking offerings" by educators and the editors of *T&L*, comprises an authentic, often surprising, snapshot of the evolution of school software over the years.

1985

Simpolicon: Simulation of Political and Economic Development
(Cross Cultural Software)

Experiments in Human Physiology (HRM Software)

Experiments in Science
(HRM Software)

Koala Painter
(Language Arts/KoalaPad)

Milliken Word Processor
(Milliken Publishing Company)

Story Tree (Scholastic)

Math Worlds: Exploring Mathematics Through Computers
(Sterling Swift Publishing Company)

The Whatsit Corporation: Survival Math Skills
(Sunburst)

1986

Chipwits
(Brainpower Inc.)

The Voyage of the Mimi
(Holt, Rinehart and Winston)

Cardiovascular Fitness Lab
(HRM Software)

Bank Street Musicwriter
(Mindscape)

Bank Street Storybook
(Mindscape)

The Newsroom
(Springboard Software)

Geometric Supposer: Triangles
(Sunburst)

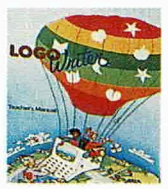
Magic Slate (Sunburst)

Muppet Learning Keys
(Sunburst)

The Other Side
(Tom Snyder Productions)

1987

Biofeedback Microlab
(HRM Software)



LogoWriter
(Logo Computer Systems)

Microzine
(Scholastic)

Bank Street School Filer
(Sunburst)

Geometric Presupposer: Points and Lines/Geometric Supposer/Quadrilaterals
(Sunburst)

Touch 'N Write: Palmer Manuscript Penmanship
(Sunburst)

1988

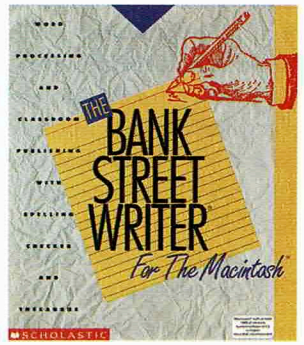
The Music Studio for the Apple IIGS (Activision)

Colortrope
(HRM Software)

The Microcomputer-Based Lab Project
(HRM Software)

Mathematics: Problem-Solving Courseware
(McGraw-Hill School Division)

These Amazing Reading Machines
(MECC)



The Bank Street Writer III
(Scholastic)

Decisions, Decisions
(Tom Snyder Productions)

1988—1989

Wordbench
(Addison-Wesley)

Calendar Crafter
(MECC)

Adventure With Charts and Graphs: Project Zoo (National Geographic Society)

Go Fish
(Queue, Inc.)

Mavis Beacon Teaches Typing
(Software Toolworks)

How the West Was One + Three x Four
(Sunburst)

Playing With Science: Temperature
(Sunburst)

1989—1990

National Inspirer
(Tom Snyder Productions)

IBM Mathematics Exploration Toolkit
(IBM)

The Children's Writing and Publishing Center
(The Learning Company)

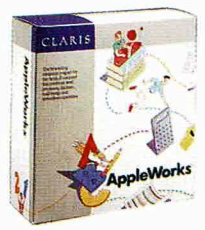
World GeoGraph
(MECC)

Class in a Box 7–12
(Microsoft)

Reading Realities: Real Life Issues
(Teacher Support Software)

1990—1991

Compton's Multimedia Encyclopedia
(Britannica Software/Jostens)



AppleWorks 3.0
(Claris)

Personal Science Laboratory
(IBM)

GTV: A Geographic Perspective on American History
(National Geographic Society)

National Geographic Kids Network: Hello I and *Acid Rain*
(National Geographic Society)

Scholastic Hyperscreen
(Scholastic)

Information Finder by World Book
(World Book Educational Products)

1991—1992

Kid Pix (Brøderbund)

IBM Education LAN and Tools
(IBM)

Wagon Trail 1848
(MECC)

HyperStudio 2.1
(Roger Wagner)

Interactive NOVA Series: Animal Pathfinders/Miracle of Life
(Scholastic)

1992—1993

Living Books: Just Grandma and Me
(Brøderbund)

Science 2000
(Decision Development Corporation)

Columbus: Encounter, Discovery and Beyond
(EduQuest/IBM)

Illuminated Books and Manuscripts
(EduQuest/IBM)

Microsoft *Bookshelf for Windows*
(Microsoft)

MediaText
(Wings for Learning/Sunburst)

1993—1994

Algebra—stand-alone
(Brøderbund)

MacWrite Pro
(Claris)

Kid Works 2
(Davidson)

KidDesk
(Edmark)

Millie's Math House
(Edmark)

IBM Process Writing Package
(EduQuest)

First Connections: The Golden Book Encyclopedia—stand-alone
(Hartley Courseware)

Algebra—networked
(Jostens Learning)

First Connections: The Golden Book Encyclopedia—networked
(Jostens Learning)

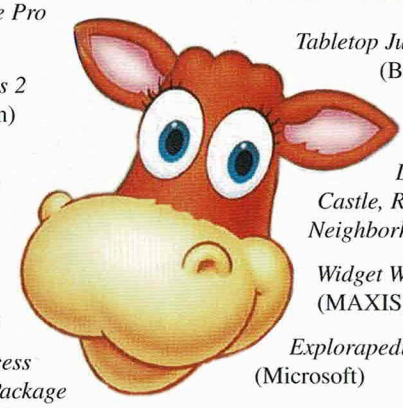
Encarta
(Microsoft)

Life Story
(Sunburst/Wings for Learning)

1994—1995

Multimedia Workshop
(Davidson)

Thinkin' Things
(Edmark)



Toolkit for Interactive Mathematics
(IBM/EduQuest)

Steps to English Language Development
(Jostens Learning)

Redshift
(Maris Multimedia)

MathKeys
(MECC/Houghton Mifflin)

1995—1996

Tabletop Junior Math
(Brøderbund)

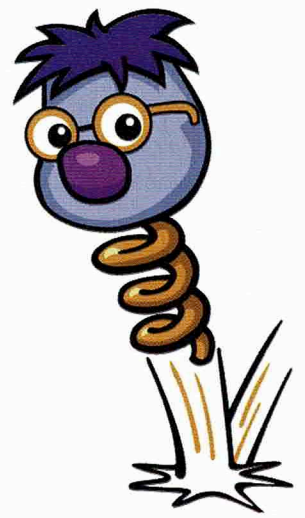
Imagination Express: Destinations: Castle, Rainforest and Neighborhood (Edmark)

Widget Workshop
(MAXIS)

Explorapedia
(Microsoft)

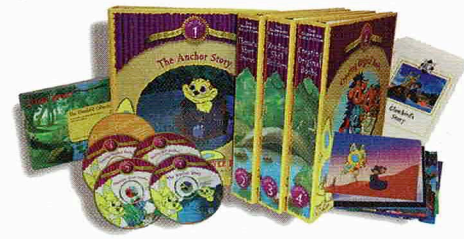
1996—1997

Logical Journey of the Zoombinis
(Brøderbund)



HIP Biology 1 and 2
(Center for Image Processing in Education)

World War II (FlagTower)



Little Planet Literacy: Glowbird and Ribbit Collections
(Little Planet Publishing)

Hollywood (Theatrix)

1997—1998

An Odyssey of Discovery: Writing for Readers
(Pierian Spring Software)

CCCNet
(Computer Curriculum Corporation)

1998—1999

Electric Library
(Infonautics)

ELLIS Intro
(CALI)

Let's Go Read! An Island Adventure
(Edmark)

First Class Collaborative Classroom
(SoftArc)

1999—2000

Encarta Africana
(Microsoft)

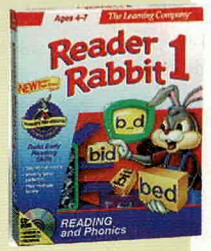
Open District
(Chancery)

Web Design 101
(Macromedia)

Readers' Choice Awards

Best Software From the Earliest Days of Educational Computing

- *Oregon Trail* (MECC)
- *AppleWorks* (Claris)
- *Print Shop* (Brøderbund)
- *Bank Street Writer* (Scholastic)
- *Reader Rabbit* series (The Learning Company)



- *HyperCard* (Claris)
- *Kid Pix* (Brøderbund)
- *Rocky's Boots* (The Learning Company)
- *Gertrude's Secrets* (The Learning Company)
- *Magic Slate* (Sunburst)
- *Voyage of the Mimi* (Holt, Rinehart and Winston)
- *Carmen Sandiego* series (Brøderbund)
- *The Factory* (Sunburst)
- *The Children's Writing and Publishing Center* (The Learning Company)
- *LogoWriter* (LCSI)
- *Math Blaster* (Davidson)
- *Number Munchers* (MECC)
- *Living Books* (Brøderbund)
- Microsoft *Word/Works*
- *Snooper Troops* (written by Tom Snyder for Spinnaker)

Best of the Net

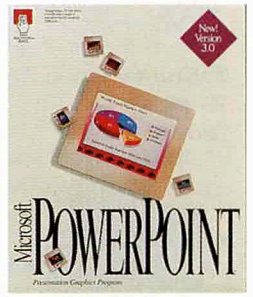
- Kathy Schrock's Guide for Educators (discoveryschool.com/schrockguide/)
- Yahooligans! (www.yahooligans.com)
- NASA (www.nasa.gov)
- American Library Association (www.ala.org/parents/)
- Ask Jeeves (www.ask.com)
- Technology & Learning (www.techlearning.com)
- Classroom Connect (www.classroom.com)
- Scholastic (scholastic.com)
- Education World (www.education-world.com)
- Global Schoolhouse (www.globalschoolhouse.com)
- Educast (www.educast.com)
- Discovery Channel (www.discoverychannel.com)
- Apple Learning Interchange (www.ali.apple.com)
- Teachers Helping Teachers (www.pacificnet.net/~mandel/index.html)
- Exploratorium (www.exploratorium.com)
- Fun Brain (www.funbrain.com)

Most Important Educational Technology Gurus of the Past Two Decades

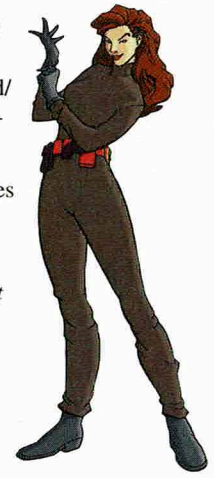
1. Bill Gates
2. Steve Jobs
3. Steve Wozniak
4. Seymour Papert
5. Roger Wagner
6. David Thornburg
7. Alan November
8. Tom Snyder
9. Jamie McKenzie
10. Linda Roberts

Best Software of the Past Decade

- *HyperStudio* (Roger Wagner)



- *PowerPoint* (Microsoft)
- *Word* (Microsoft)
- *ClarisWorks* (Claris)
- *Thinkin' Things* series (Edmark/IBM)
- *Kid Pix Deluxe* (Brøderbund/The Learning Company)
- *Oregon Trail* (The Learning Company)
- *JumpStart* series (Knowledge Adventure)
- *Storybook Weaver* (MECC/The Learning Company)
- Anything by Tom Snyder Productions
- *Logical Journey of the Zoombinis* (Brøderbund/The Learning Company)
- *Math Blaster* series (Davidson/Knowledge Adventure)
- *The Living Books* series (Brøderbund/The Learning Company)
- Microsoft *Office/Publisher*
- *Where in the World Is Carmen Sandiego?* (Brøderbund/The Learning Company)
- *Reader Rabbit* series (The Learning Company)
- *Orcas in Our Midst* (Sunburst/Houghton Mifflin)
- *Inspiration* (Inspiration Software)
- *Creator* (Stagecast)
- *DroidWorks* (Lucas Learning)

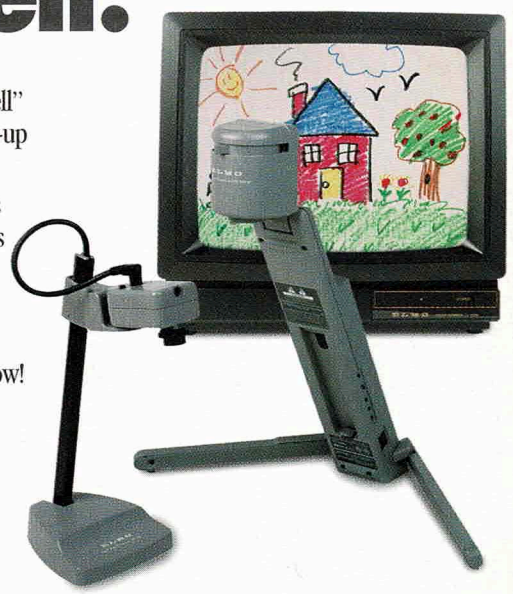


We put the "show" back in "show and tell."

Remember "Show and Tell"? You stood up there, proud and tall (or scared and small), and showed the whole class the picture you made or the frog you caught. Now imagine "Show and Tell" with an ELMO Desktop Presenter. Focus on a tree, zoom in on the house, wow them with a close-up of the frog's head and blinking eyes.

With a choice of models that are easy to use and readily affordable, ELMO Desktop Presenters capture an image so that you can capture your audience in a boardroom or classroom whether it's across the hall, across town, or across the nation. No wonder so many professionals rely on ELMO. We've been earning top grades in visual imaging equipment since 1921.

For more information about ELMO Desktop Presenters, or any other ELMO imaging product, call 1-800-947-ELMO today or e-mail us at *elmo@elmo-corp.com*. Turn on your ELMO tomorrow!



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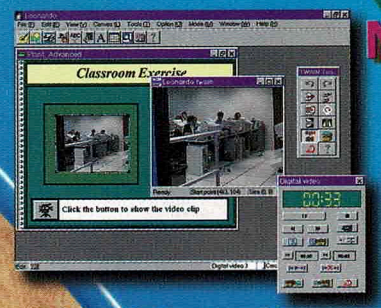
Leonardo's MULTIMEDIA TOOLBOX™

Suitable for Grades K-12

NEC's Leonardo Project Contest '99!



Multimedia

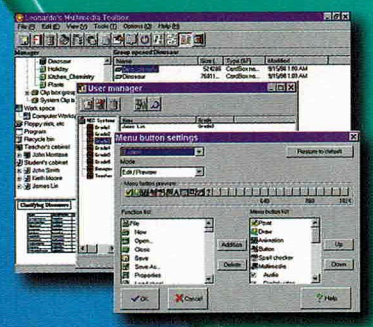
Leonardo's Multimedia Toolbox is the most comprehensive suite of creativity tools for students and teachers. Leonardo's tools arouse students critical thinking and problem solving skills in a collaborative, networked classroom environment.

Students and teachers can use Leonardo's Multimedia Toolbox to do research and prepare reports. Everything can be accomplished in one place at one time .

Prospect High School in Saratoga, California pioneered Leonardo's MultimediaToolbox. "Leonardo is a versatile and powerful tool for classroom presentations - a real attention getter!"
- Pat Huddleston, Science Teacher
Prospect High School

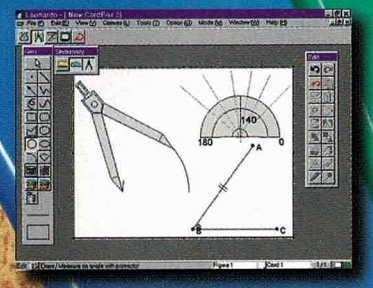
On Display at the Following Conferences in 1999:
Technology & Learning Conference in Dallas, November
COMDEX Fall '99 in Las Vegas, November

NEC's Leonardo would like to invite you to participate in Leonardo's Project Contest, 1999.
No Purchase is Necessary.
There are two eligible categories for submitting projects; one for students and one for teachers.
Visit the Leonardo web site or call us for more information.

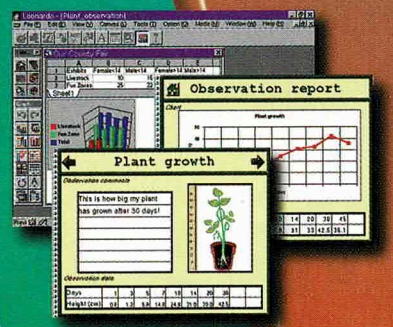


Project Management

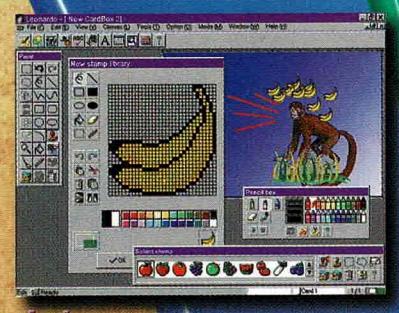
Internet & HTML Converter



Geometry

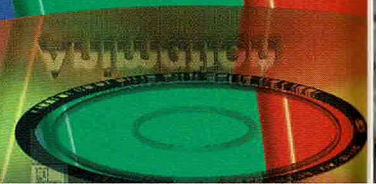


Spreadsheets



Paint

Animation



NEC
NEC Systems, Inc.

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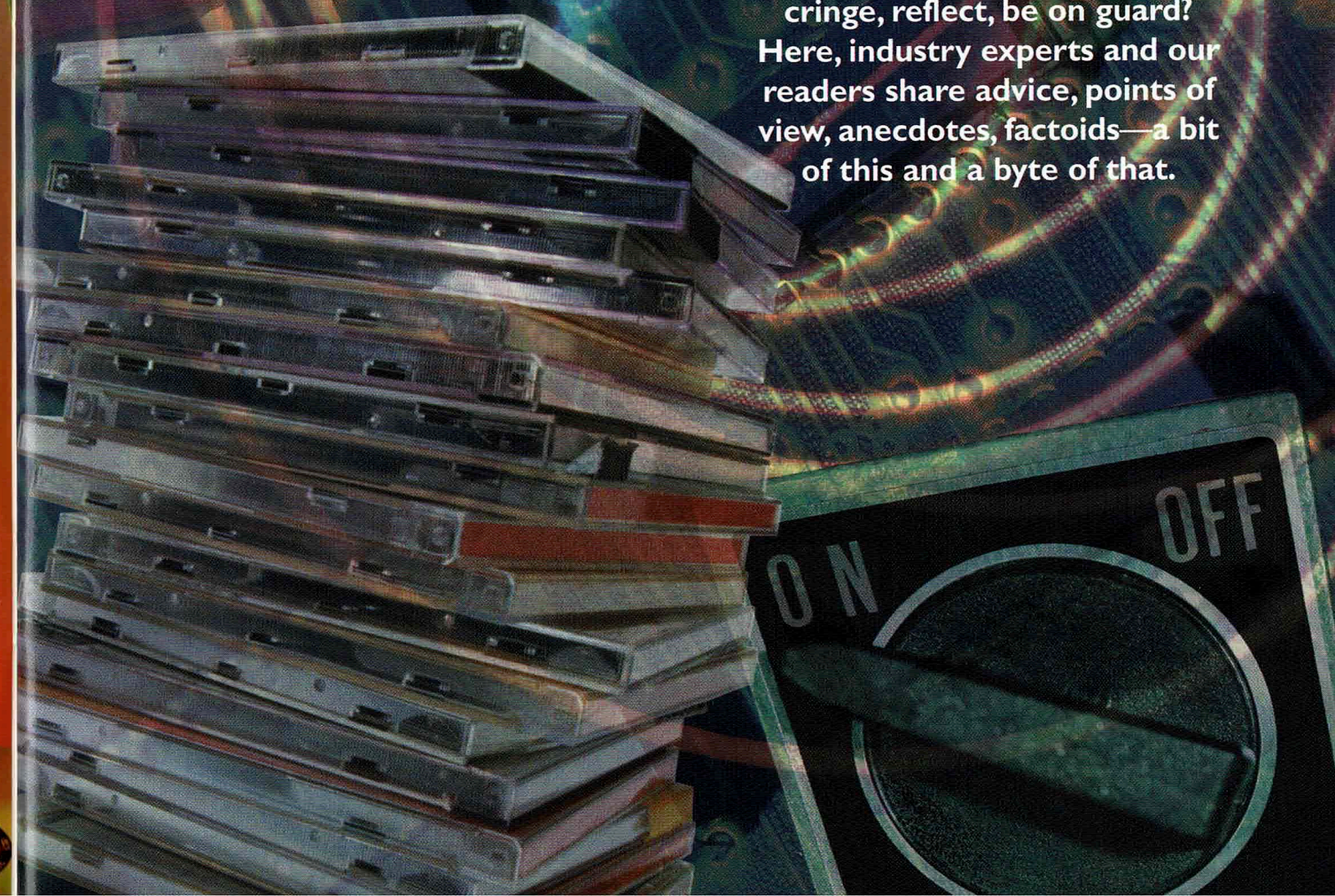
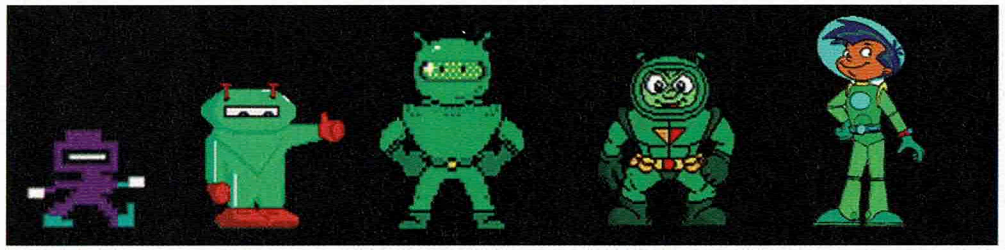
Bits and Bytes

What wowed us? Surprised or disappointed us? Made us laugh, cringe, reflect, be on guard? Here, industry experts and our readers share advice, points of view, anecdotes, factoids—a bit of this and a byte of that.



Then and Now



Math Blaster's Blasternaut
(Knowledge Adventure)

All Transmission Rates Are Not Created Equal

E-mailing the Declaration of Independence (344,000 bits)

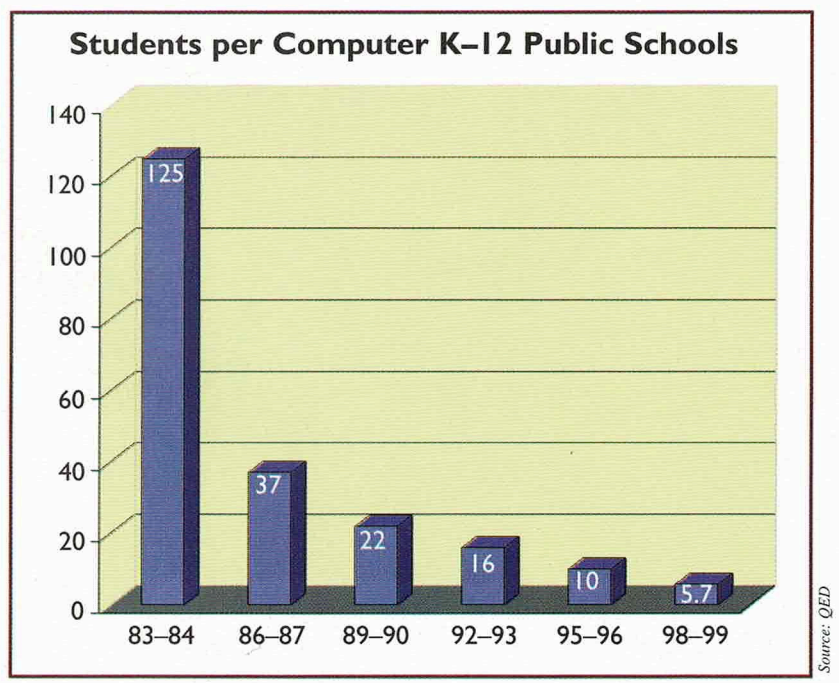
Year	1965	1993	1998	1999
Rate	1200 bps*	115,200 bps	448,000 bps	39,872,000 bps
Speed	4 Minutes and 46 seconds	3 Seconds	0.76 Second	86/1000 of a Second

Source: QED

*Bits per second

> I swore off computers for about a year and a half—the end of ninth grade and all of tenth. I tried to be normal, the best I could.
>
> — *Bill Gates, Microsoft Corp.*

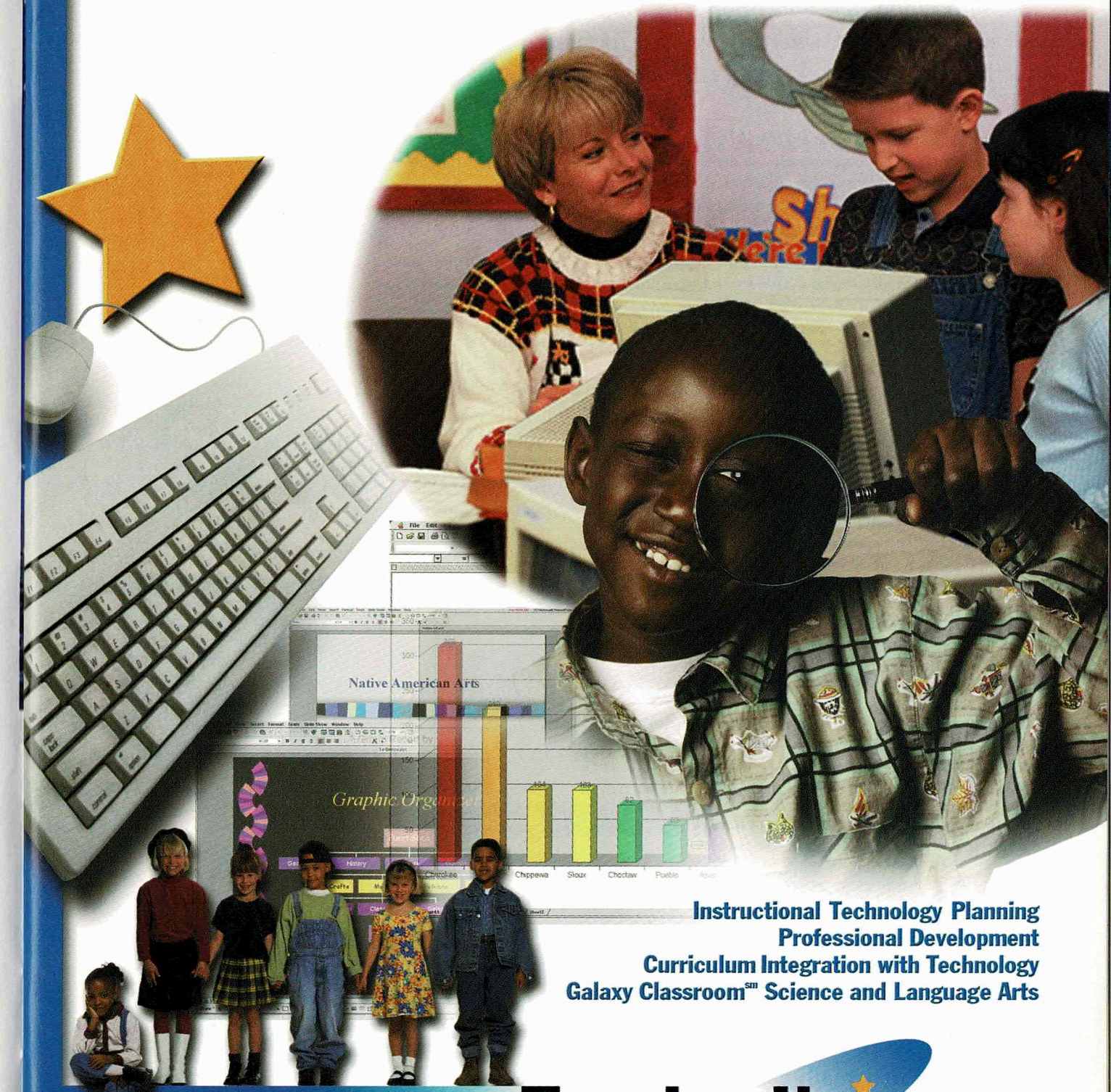
> If we continue to use yesterday's mindset in today's classroom, we may be out of business tomorrow.
>
> — *Robert Kriegel*



Ideas That Missed by a Hair

- The 255-color display
- *Mavis Beacon Teaches Penmanship*
- yoohoo.com
- *Where in the Underworld Is Carmine Sandiego?*
- The Apple meMac
- The Pasquale programming language
- The *Oregon Trail Mix* nutrition program
- *OveractiveStudio*
- *JumpStart Brain Surgery*
- MRS-DOS
- The PsalmPilot

Our heroes are teachers.



Instructional Technology Planning
Professional Development
Curriculum Integration with Technology
Galaxy Classroom℠ Science and Language Arts

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From the Experts

We asked some of our friends—teachers, software publishers, journalists, tech gurus and other long-time educational technology users—to offer their perspectives on what we've achieved, where we've gone awry, and the best way to proceed from here. Here's what they told us.

"Computer technology unexpectedly changed the learning process. Because we had too few computers, students worked more collaboratively, and because teachers didn't know how to use the technology, they stayed on the sidelines and let students teach."
— Sue Talley, Pepperdine University

"We've matured in our understanding of how to take advantage of technology in schools. We now have a storehouse full of great examples of ways it can be used to benefit learning."
— Jane Boston, Lucas Learning Ltd.

"We're still only about 10 inches into the 100-yard dash of technology."
— Warren Buckleitner, Children's Software Revue

"Keep focused on the educational purpose and choose the appropriate technology in the proper dose."
— Joe Clark, Videodiscovery

"Technology has broken down the isolation and artificiality of schools and classrooms to connect kids and teachers to the rest of the world in ways never before possible."
— Michael Simkins, Silicon Valley Network

"There has been a lack of understanding of the kind of professional development needed to give teachers opportunities to explore the possibilities of technology."
— Bonnie Bracey, consultant and former teacher

"Teachers need to take greater responsibility for their own learning, especially learning related to use of technologies in the classroom."
— Merle Marsh, Worcester Preparatory School, Massachusetts

"Use the technology to inspire and empower the learners, and then step back and let the learners be the guides."
— Margo Nanny, Interactive Learning Design

"The traditional structures within schools impede the substantial redesign of the learning process which technology affords and kids need."
— Jim Laffey, Center for Technology Innovation in Education

"Learn with your students and colleagues. Keep learning."
— Beverly Hunter, Boston College School of Education

"One of the biggest disappointments has been the attempt to measure the productivity of technology in schools without understanding the importance of changing the context in which it is being implemented."
— Bruce Goldberg, Co-Nect

"With the help of technology we are better equipped to move beyond traditional schools where passive students receive fixed bodies of knowledge, toward dynamic classrooms where students construct meaning from a wealth of immersive experiences."
— Rita Levinson, ScreenPlay Interactive Media Group

"Technology has renewed the love of learning and the excitement of teaching for many educators."
— Carol Edwards, Foundation for the Improvement of Education

"The biggest disappointment has been the creation and maintenance of a digital divide."
— Sara Armstrong, The George Lucas Educational Foundation

"Technology has empowered kids to take more control of their learning, to develop inquiring minds, to find new ways of learning, and above all (which is to say, below all) to master new technology."
— Bob Mohl, Floating Point Medi

> "[Computer graphics and animations] aren't really necessary…. When you refrain from jazzing up a program to give students false interests, you're actually letting them discover they can learn something."
>
> *— B.F. Skinner (from an interview in the early days of educational technology)*

Personals

Bill Gates and I had a telephone discussion in the early days of Microsoft. I explained how a couple of his business practices would not work (I was a frustrated customer at the time), and he explained that he appreciated my suggestions—but wasn't about to change anything. He's a man of his word—he ignored my advice. Given how successful he's been, I often wonder just how much more successful he could have been if he had listened to my advice.
— Walter Koetke, AIT

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The Readers' Voice

Here we bring you a range of opinions, experiences, tips, and more from readers who participated in our online Millennium Survey.

Words of Wisdom for Educators Just Starting Out With Technology

- Be patient.
- Take it slowly.
- Play, play, play—get hands-on practice daily.
- Let the kids teach you.
- Don't be afraid—you can't break the computer unless you pick it up and drop it on the floor.
- Don't reinvent the wheel—get advice from those who know. Attend all the training sessions you can.
- Begin by integrating the computer into a unit you love.
- Get involved in a collaborative project.
- Always have a contingency plan—a 10-minute thunderstorm did in our big Back-to-School Technology Night.
- Dive in; use it; do it; run with it; jump right in; learn from your mistakes.
- Form a technology support group.
- Be sure all students are engaged with the technology, not just white males.
- Don't get too comfortable with what you know—it will all change.
- Keep in mind that technology is only a tool.
- Keep an open mind.

Educational Technology Bloopers

In class, I went to Whitehouse.com instead of Whitehouse.gov—you can imagine the rest.

As the school computer coordinator, I was extolling the virtues of the Internet to 400 skeptical parents at a PTA meeting. Then I couldn't get online.

I was teaching a *Word* in-service one day. A student said, "I didn't know anyone could teach that." I said, "Really? It's not that difficult." She said, "No, I meant, doesn't everyone already know it?"

I used *PowerPoint* to teach the class about adjectives. There was a graphic of a baby in a diaper with an arrow pointing to the diaper. You can imagine the adjectives I got.

In a master's class for instructional technology, I was supposed to present my video to classmates. Accidentally, I clicked on a tape I'd made of myself wearing bunny ears and running across the screen.

Teachers at my school were complaining that their new iMacs didn't match their old computers.

We paid a technician over $500 to find out that the plug to the keyboard was loose.

At a training session, teachers were pointing the mouse at the screen and waiting for something to happen.

My fourth-graders were doing a Net search for the Chesapeake Bear for a unit on animals of Maryland. It turned out to be the wrong Bare.

I was discussing plug-ins with my sister when she interrupted to say she especially liked the pine ones—they smelled so nice in the bathroom.

I was training a class of teachers on how to use technology. When I asked a person to move the mouse to the upper-right-hand corner of the screen, she actually physically took the mouse and placed it on the upper-right-hand corner of the screen.

I was using a presentation cart, computer and large TV screen to teach a lesson. Halfway into it, the kids informed me there was a soap opera playing on the TV.

A student told the substitute that the mouse was out—meaning unplugged. She screamed.

Half the year had gone by when a teacher came to me complaining her computer had been broken from the start. Turned out she was unaware of the monitor's "on" button.

> "Some people change because they see the light, others because they feel the heat."
>
> — *David Thornburg*

> "The most desirable interaction with a network is one in which the network itself is invisible and unnoticeable."
>
> — *Nicholas Negroponte*

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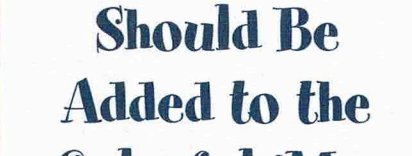
What New Hues Should Be Added to the Colorful iMac Computers?

- Rainbow, to represent the original, colorful Mac symbol
- Clear, so kids can see the inner workings of the computer
- Banana yellow
- Black or other dark colors—have you seen what a Mac looks like after one month of students touching the CPUs and other peripherals?
- Two-tone school colors to encourage school pride
- Candy-apple red
- Soothing peach to match the color of school walls
- Make them changeable like the old "mood rings"
- Hot pink



- More subtle colors—soft blues or cream
- Computers with customized pictures on them—this would also serve as a safety measure against theft
- Paisley, abstract and Victorian prints
- The more the better—how about a new one every year?
- Gray for the IBM crossovers
- Who cares about the colors, just add a hard drive

"Nice girls didn't study programming in the mid-sixties. — *Leslie Eiser*

My Most Memorable Trade Show or Conference Experience Was...

...taking apart a computer and actually getting it back together again.

...listening to futurist Jaron Lanier speak—it was like being able to time travel.

...getting on the World Wide Web for the first time and suddenly realizing its possibilities.

...my first visit to Macworld—I felt like I was in Disneyland.

...teaching a summer institute and watching technophobic teachers turn a corner and "get it."

...observing students interact with an industry expert via videoconferencing.

...the feeling of being "illiterate" in the face of so much to know and absorb.

...the first time I saw a robot programmed.

...watching a kindergarten student teach a roomful of adults how to make business cards.

...learning to use *Lego Logo*.

...an Apple seminar demonstrating voice recognition.

...a workshop that demonstrated how to create Internet projects with schools from around the world.

...the party put on by Microsoft to launch *Windows 95* at FETC.

...the Hyperfests by *HyperStudio*.

...having a speaker at a conference several years back explaining that technology was a tool. That single idea has helped me approach training and planning from a different perspective.

...seeing so many educators sharing the vision of technology.

"My worst fear as a parent is that my kids will do really well in school, learn technology skills but not be able to move out of my house when they are 25. What they really need to learn is to invent and manage their own work." — *Alan November*

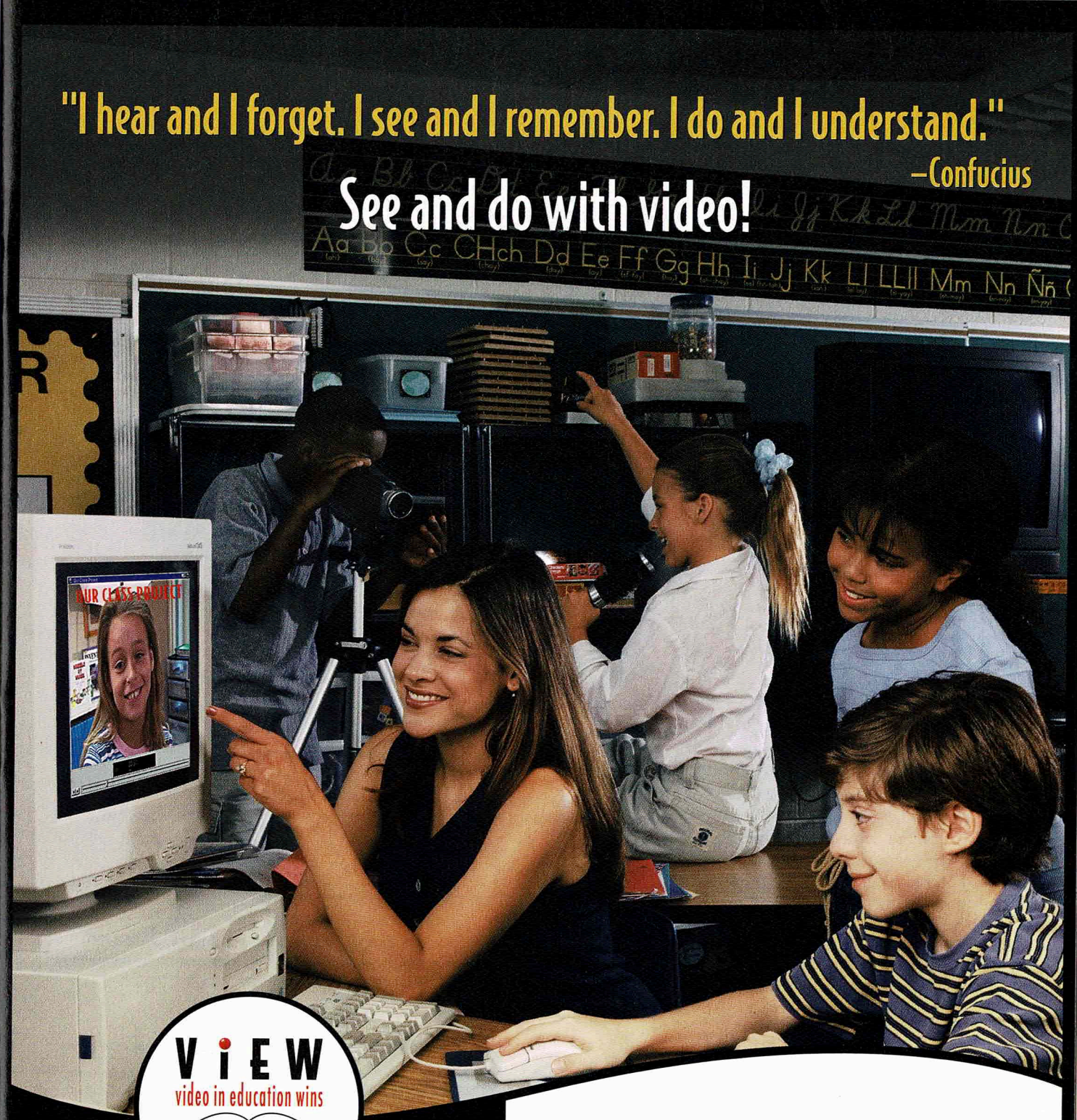
Personals

The first time I ever saw a floppy disk, it was given to me by another editor at *Learning* magazine where we both worked. "You've got to take a look at this," he told me. "It's going to revolutionize education." The disk sat on my desk for quite a while, but finally one day, I got up the gumption and picked the thing up. I took it out of its sleeve and examined it. Then I carefully pried apart the seams of the square cardboard jacket. As you can imagine, this took some doing. By the time I got to the magnetic disk inside, my fingernails were ragged and I was in no mood to be impressed. I marched into my friend's office, disk in one hand and jacket in the other. "This may *be* God's gift to education," I told him, "but they've sure got to work on their packaging!"

— Holly Brady, Stanford Alumni Association (and former editor of T&L*)*

"I hear and I forget. I see and I remember. I do and I understand." –Confucius

See and do with video!



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Catch of the Day

Big Fish, Little Fish

Over the last decade, the software industry has evolved from numerous startup companies to a "mature" industry with major consolidation. Critics worry that along with this consolidation has come a decrease in creativity—with more energy focused on repackaging and regrouping products than on building innovative new titles. Whether or not you agree with this conclusion, it's hard to argue with the fact that the numerous mergers and acquisitions have caused a great deal of confusion on the part of software buyers. What's happened to your favorite publishers and where do you turn to see if they're still producing products? Here's the scoop on who's swallowed whom lately.

Disclaimer: We make no guarantee this information will still be accurate by the time you read it.

Havas Interactive

- **Davidson & Associates** acquires smaller firms
  - First Byte ('92)
  - Blizzard Entertainment ('94)
  - Educational Resources ('92)
  - Schoolscape ('95)
  - Learning Ways ('94)
  - Maverick ('95)
- then was acquired by **CUC** ('96) which then purchased
  - Berkeley Systems ('97)
  - Knowledge Adventure
  - Sierra Online ('97)
- CUC merged with HFS and changed its name to **Cendant** ('97)
  - Purchases Roger Wagner Publishing '98
  - A corporate conglomerate into real estate, finance, discount travel, and dining
- **Havas bought Cendant** ('98)
  - A French pulishing conglomerate owned by a French water company
- Name changed to **Havas Interactive**
  - Havas has 3 divisions
    - Knowledge Adventure
      - Fisher-Price license returned to Mattel for Learning Co.
    - Blizzard Entertainment
    - Sierra Online

Mattel

- Spinnaker Software
- Wordstar
- SoftKey
- Merged into **SoftKey** ('93) which then acquires
  - Aris Entertainment
  - Edusoft
  - MECC ('95)
  - Compton's New Media
  - Compton's Learning
- SoftKey buys The Learning Co ('96) and changes its name to: **The Learning Co.** which then buys
  - Learning Services ('97)
  - Broderbund ('98)
  - Soft Source ('98)
  - Fisher-Price Software
  - Skills Bank Corp. ('97)
  - Micro Systems ('97)
  - Princeton Review
  - PF Magic ('98)
  - Mindscape ('98)
  - Palladium ('98)
  - Creative Wonders ('97)
- Then The Learning Company is purchased by **Mattel**

Other Acquisitions:

IBM
- Edmark
- Crayola
- World Book

Ripplewood Holdings
- Jostens

Houghton Mifflin
- Little Planet Literacy Series
- Sunburst Communications
  - Tenth Planet

Combined to create:
Sunburst Technologies
(a division of Houghton Mifflin Co.)

Learning Technologies Interactive
- The Voyager Company

River Deep
- Logal Software

Segasoft
- Usborne Publishing

Torstar Corporation (Canada)
- Tom Snyder Publishing

Electronic Arts
- Maxis

GT Interactive
- Humongous Entertainment
- BBN

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Illustration by children's author Peter Reynolds, author of *The North Star*

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Faith in children, trust in teachers, and a pioneering spirit. These qualities took us from our start as a print-based special-needs company to our current position as a premier provider of technology solutions for education. From voice-recognition technology to non-contact switch access for individuals with motor disabilities, Edmark is changing the face of student/computer interaction, resulting in outstanding performance. We're delivering technology tools firmly grounded in sound pedagogy, and we're dedicated to developing a strong foundation for student success, now and throughout the new millennium.

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* May 1999 survey of K-12 school districts by Quality Education Data, an independent market research firm.

Beyond Filtering... Toward Internet Productivity

There has been much discussion about Internet filtering. People ask: Do we really need to filter the Internet? Do Internet filters work, or do they block useful content? Will the government require filtering in our schools for us to receive our E-rate discount? A few years into the debate, a somewhat clearer picture has emerged, with respect to schools in particular.

Filtering discussions have often been controversial, because they touch on sensitive issues such as free speech and children's welfare. Outside of Congress, public libraries are at ground zero in this debate. To be sure, librarians are wrestling with challenging issues as they attempt to balance the interests of children and adults, while upholding their professional obligations. Only 15% of public libraries use filtering software[1]. For families with Internet access at home, about 32% are filtered[2]. Businesses are just beginning to address the issue; currently, less than 1% use access management technology[3]. Interestingly, schools are out in front of these other groups in resolving the filtering debate.

In May of 1999, 52% of US school districts were using some form of Internet filtering technology. By the end of the 1999–2000 school year, nearly 72% expect to do so[4]. It seems that schools have decided that filtering is a necessary precondition for effective use of the Internet in education. We expect that shortly, nearly every school will provide Internet filtering service for their students. Either by law, or by choice, content management will become the norm*. Like airbags in your car, an effective Internet filtering system is an invisible, practical precaution in an exciting but uncertain environment.

What have leading schools learned about Internet filtering over the last few years? Most experienced school technology managers use server-based, network-wide filtering instead of client software running on individual computers. Server solutions are superior in terms of installation, maintenance and security; most client software can be easily disabled by a smart student. Experience has shown, too, that filtering accuracy is crucial; better not to filter at all than to do so poorly. A combination of powerful technology and intensive human review has proven effective in keeping pace with the growth of the Internet, and providing the necessary filtering quality. A third lesson learned is that local control of the filtering configuration is important, so that you can customize access for your own educational community, and override filtering when necessary.

N2H2 is proud that its Bess℠ Internet Filtering Service is the most widely used content management technology in schools across America.

Now, with the issue of Internet safety largely resolved, we may turn our attention to the contribution of Internet technology in our schools. We expect that soon there will be an era of accountability for the Internet in education. After years of investment in wiring, hardware, software and training, people will start to ask, "What difference has this made?" As with other forms of educational technology, a direct causal relationship will be difficult to establish. So how can we be confident that the Internet is helping us to achieve our goals, and not detracting from them?

A growing body of data shows some cause for concern. Students appear to spend large amounts of Internet time on entertainment, commercial, and non-educational sites. Perhaps of more concern is the amount of time spent just looking for information and wading through irrelevant material. With high expectations for student achievement, and increasing time pressures on the curriculum, such large inefficiencies are unacceptable.

What's needed are Internet productivity tools for students. N2H2 has developed a powerful filtered search engine, available free on *Searchopolis*℠, at http://www.searchopolis.com. Use of Searchopolis minimizes the possibility that students will be surprised or distracted by inappropriate results for a search on a term like "slavery" or "teenage jobs." Now, we're adding more productivity tools to Searchopolis, including filtered e-mail, web-based file storage, group calendars, plus confidential, web-based grade posting.

Searchopolis is one step toward making the Internet more productive in education. There is much more to do. N2H2 is committed to providing schools with the tools they need to realize the promise of the Internet. We value our partnerships with educators, and we share your vision of technology-enabled learning.

N2H2, Inc.

Intelligent Technologies for a Safe and Productive Internet

[1] Filtering Facts, http://www.filteringfacts.org
[2] Annenberg Foundation Internet report, May 1999
[3] IDC Worldwide Market for Corporate Internet Access Control, July 1999
[4] QED market research study, May 1999

** N2H2 does not support mandatory filtering legislation, preferring that schools make their own decisions about how to manage Internet content.*

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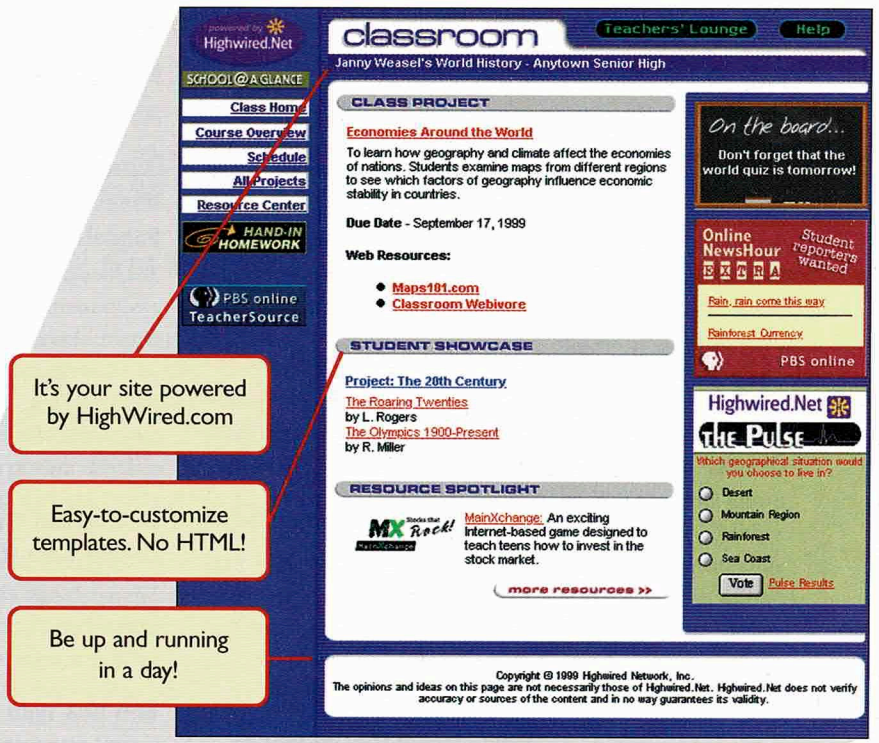
Highwired.Net
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CLASS PROJECT
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To learn how geography and climate affect the economies of nations. Students examine maps from different regions to see which factors of geography influence economic stability in countries.
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Web Resources:
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Classroom Webivore
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Project: The 20th Century
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by L. Rogers
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by R. Miller
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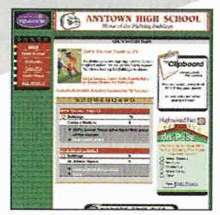

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HighWired.com is the global high school community, providing free web-publishing tools for the major areas of high school life—classrooms, guidance offices, newspapers, sports teams, student activities, and digital yearbooks. By using the highest-quality products and services, and working with education leaders as partners, HighWired.com has built the largest online international network of high schools.

HighWired.com was founded in April 1998 with the vision of becoming the premier online service for high schools by empowering them to publish and network on the Internet. Since then, the company has developed a suite of six distinct publishing tools that share the same key benefits:

- The tools are completely free to schools
- They don't require knowledge of HTML or Internet programming, and there's no need for training or user's manuals
- Setting up a web site is fast and convenient—educators can be up and running in one school day, and can use HighWired.com from any computer with an Internet connection
- Schools are automatically connected to the largest online network of high school educators and students
- Top-of-the-line partnerships provide content and recognition opportunities for students in all six product areas
- Staff areas are password-protected so that educators can use HighWired.com conveniently and securely

Educators who sign up for HighWired.com's tools enjoy the combination of easy-to-use Internet tools, valuable subject matter, and grade-specific content. And HighWired.com uses comments and feedback from its vast network of educators and students to continue to develop products that suit their needs.

Since its founding, HighWired.com has grown quickly, both in the United States and abroad. "Students who are part of the HighWired.com network have opportunities many high school students do not have. From student athletes using their sports sites to target college recruiters, to students in the National Honor Society providing information to an international honors program, HighWired.com is the vehicle for high schools to communicate with each other and the world," said Mark Johnson, co-founder of HighWired.com.

To date, HighWired.com's network includes more than 4,000 schools in all 50 states and 46 foreign countries.

Anyone can search the HighWired.com network of high schools by visiting the home page (www.highwired.com). From there, link to demonstrations of all six HighWired.com publishing products. Then view the unique community of high schools by searching the network by state or country. Or read the National Edition newspaper (www.highwired.com/national/national/), featuring this week's best articles from the network's student journalists.

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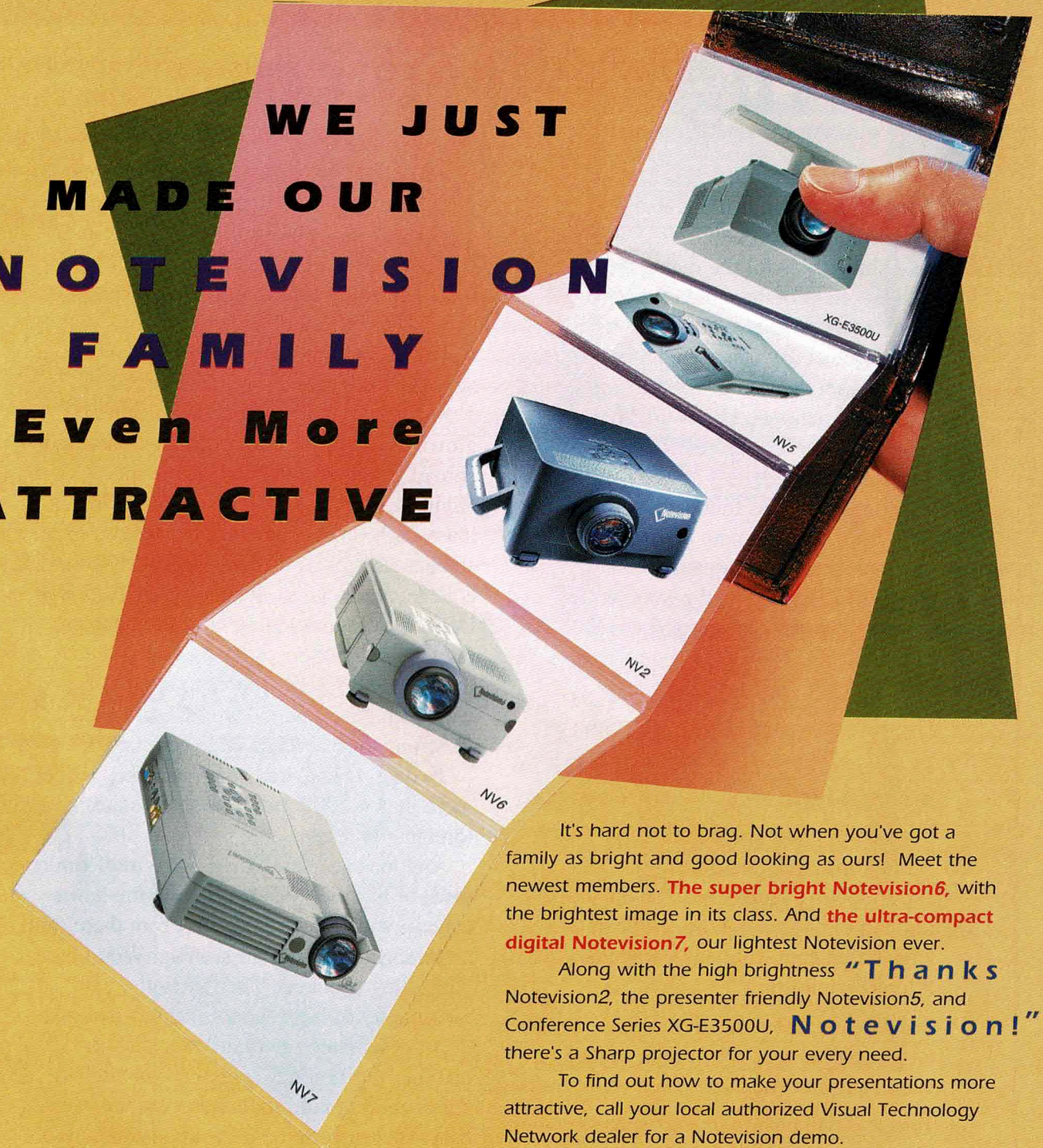

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Sharp Electronics: *A Leader in Educational Projection Technology*

The T.H.E. Report's 1998 Educational Technology "Plans to Purchase" survey listed Sharp as the #1 brand of Data Display Projectors being considered for purchase by educators and trainers. Sharp, long considered the leader in educational projection technology, is well-known for the quality, value, and durability of its full product line.

With projectors in many of the country's major colleges and universities, Sharp has a strong commitment to the education market. Schools that utilize Sharp presentation products include, UCLA, Stanford, Florida State, Montclair State, and Michigan State.

Sharp is also a major contributor to the Education Communications Fund (ECF). The ECF is a non-profit charitable and educational organization chartered to support the audio-visual communications industry. The Foundation generates support from corporations, philanthropic foundations and government sources to improve and expand the educational programs of the International Communications Industries Association, Inc.® (ICIA®).

Sharp's Professional LCD Projector product line includes seven distinct models, each designed for specific education and training applications. High-end models are available for permanent installation in university lecture halls and auditoriums, lighter-weight high-brightness portable models are offered for classroom and other meeting room applications, and lower cost "value-priced" data and video models are included in Sharp's line-up for education, coaching and training needs.

"We have specific dealers that target the education market," said Jerry Ganguzza, senior product marketing manager, Sharp LCD Products Division. "Our dealers understand the business better and since they're well situated geographically, they can build a close relationship with the customer and add value to any purchase. Service and support become simple when your dealer is local, rather than located in another state."

Recent testimonials from Florida State University and Morton School District in Illinois demonstrate Sharp's commitment to meeting the needs of education professionals.

At Florida State University, chemistry and biological science demonstrations are being seen as they never have before. By connecting the Sharp projection system to a camera, and with the use of a macro lens, classrooms with hundreds of students are witnessing biology experiments that previously, only a few at a time could see.

The Florida State classrooms have the projectors ceiling mounted, in projection booths, or on A/V and multimedia carts, depending on the design of the room and needs of the instructor. Professors can display Web pages, as well as deliver high-resolution presentations or show video.

"The biggest benefit of using Sharp LCD projectors is that professors find them easy to use, so they can concentrate on teaching," said media specialist Bruce Meintjies, College of the Arts and Sciences, Office of the Dean, at FSU. "They require very little maintenance. Currently, we have more than 30 Sharp projectors around the University."

In Illinois, the Morton School District is using four Sharp LCD projectors to replace the chalkboard. The units are used in several computer instruction classes, including sections for non-English speaking and learning disabled students, at two high schools in the district.

"It's one of the greatest teaching aids we have added during my 29-year career," said business education teacher Bob Walter. "Many students aren't auditory learners. With Sharp's projectors, I can demonstrate software that is difficult to describe, but easy to show. Students can look at the screen and duplicate what they see."

Sharp distributes a full line of LCD projectors, LCD monitors and professional video equipment (including TVs, VCRs and Viewcam LCD camcorders), offered for rental, lease or purchase by its national network of authorized dealers. For more information, please contact Sharp Electronics Corporation, Professional LCD Products Division, Sharp Plaza, Mahwah, NJ 07430-2135.

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wwwrrr's Commitment to the K–12 Technology Market

Wwwrrr is a company with a deep respect for educators and a real understanding of the needs of schools. Our founders, Dale LaFrenz and Paul Gullickson, have been developing and marketing educational software for K–12 students for more than 55 years combined—at MECC and The Learning Company. Our employees are passionate about education. We have designed curriculum, taught in classrooms, managed district budgets, led school boards, and raised children of our own.

Our company's vision is ambitious yet simple: "Empowered teachers, connected to parents, in an exciting learning environment for students." Everything we do and create is to further this purpose. Technology is our means to this end.

We start with training—because unless people know how to use the tools and access the resources, nothing else really matters. Our training programs help teachers untangle the Web and weave it into their classroom. And they show parents how to use it, too. Best of all, they make the process easy, fast, and fun.

The educational community also needs to be connected. Schools want to engage parents and strengthen their involvement. Parents want information. Teachers want a dialogue with parents. The Internet is ideal for bringing these groups together. wwwrrr products let schools and teachers post information about schedules, activities, assignments and classwork online—where parents and students can access it. We give them the tools to create online communities—where people can drop in anytime, from anyplace they happen to be.

Finally, there is the matter of using the Internet for learning. Yes, there are good educational software products and Web sites out there. But wwwrrr has the expertise to match and surpass them. Our K–12 software is dynamic, engaging and instructionally sound. And it is supplemented by carefully selected third-party products and resources.

From our training tools to our courseware to our interactive Web sites, wwwrrr uses the most sophisticated technology to make our products intuitive and simple. And we deliver them all online, at a friendly place where parents, students and teachers can go to explore, learn, shop and connect.

"Through the years, I have had many opportunities to work with wwwrrr's founders—and I continue to be impressed. If anyone can help the educational community realize the Internet's vast potential, they can. They won't just be following the revolution, they'll be leading it."

— Peter Li, President & CEO, Peter Li Education Group

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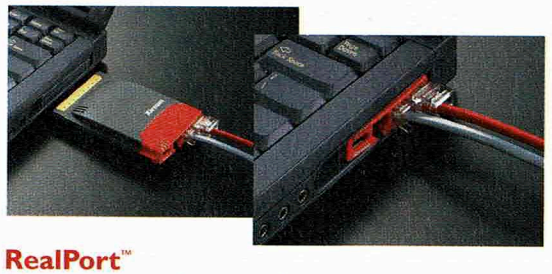

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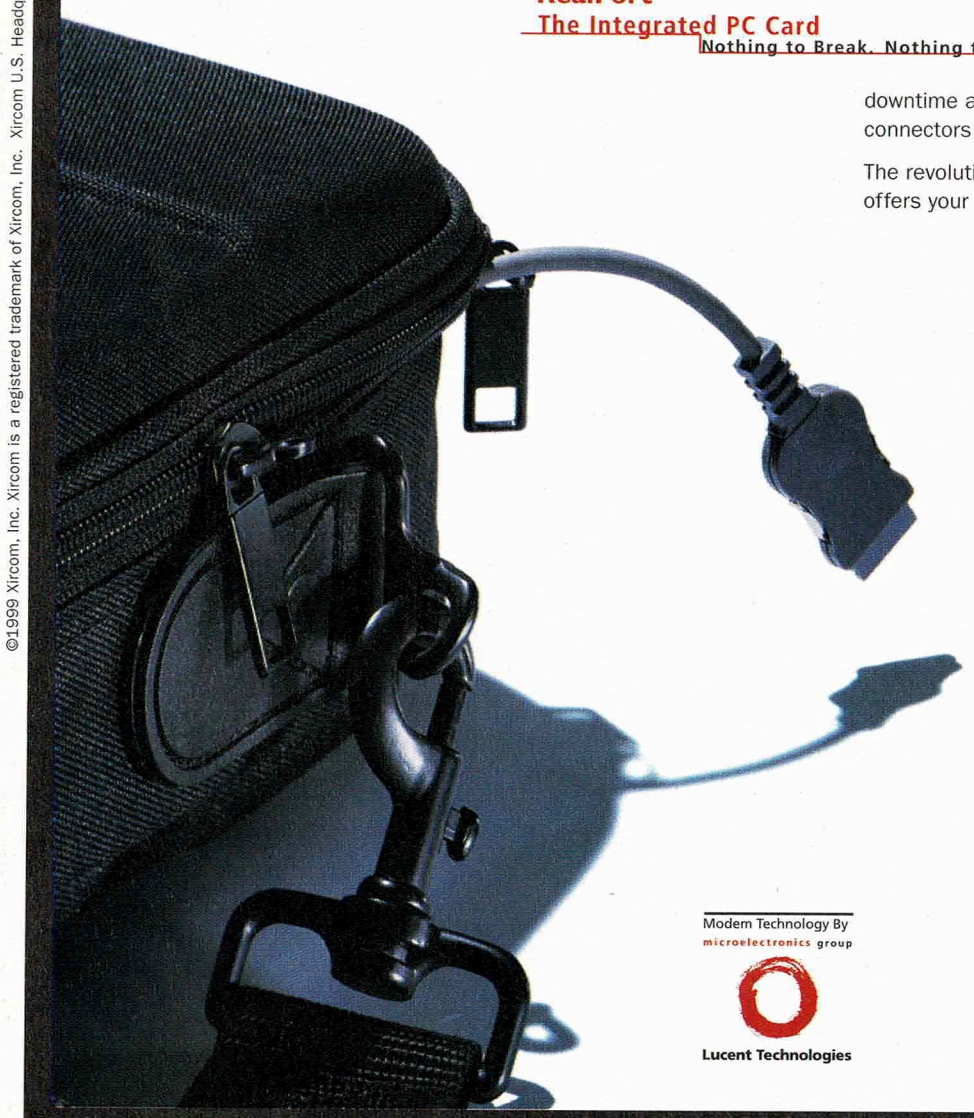

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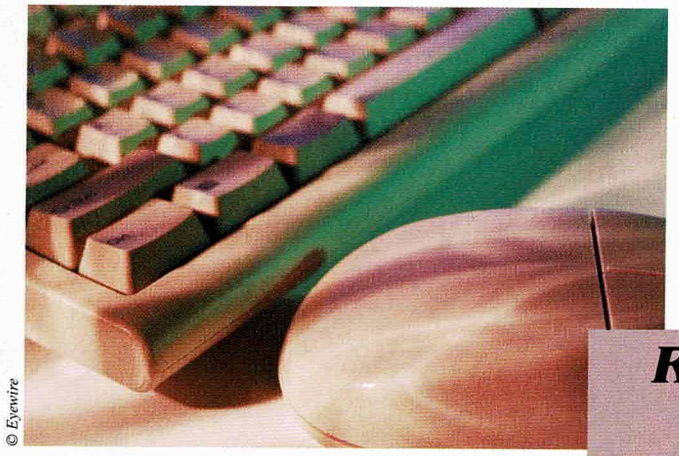
Turning Points

Sometimes it's a defining moment; more often it's a gradual realization. In the stories that follow, students and educators describe how their lives—and the lives of people important to them—have been changed by computer technology.

From Misfits to Software Pioneers

Unless you were involved in education during the days of computer time-sharing, you may never have heard of the Huntington Computer Simulations, but they were some of the best of their era. Lud Braun, the man behind the programs, describes their creation—and their impact on the students who helped him build them.

The Huntington Computer Project started in about 1970 with a grant from NSF to explore ways of using computers in high school classrooms. My role was that of project director and (to hear Mike Visich, my co-director, tell it)



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profligate spender of funds.

We worked with 10 high schools in the town of Huntington, Long Island (hence the program name). With input from teachers at those schools, we developed about 80 programs in biology, chemistry, mathematics, physics, social studies, and teacher assistance. The hallmarks of the Huntington simulations were tight integration into the then-current curricula, their strong documentation (which included a teacher's guide, a student manual, and a resource guide), and the accuracy of their models.

One of the things that I did in the Huntington Project was to use it as a "rescue" site for wayward students. During my years of teaching, I frequently came across students who I knew were bright, but who rebelled at "the system" to the point that they were at the brink of being expelled from school. Because we needed—and had a budget for—good programmers, and because so many of these rebels were really good programmers (I have often wondered if there is a connection between rebellion among the young and programming competence), I hired a number of them to do the programming. The interesting thing to me was that, as soon as I showed them respect for their abilities, and gave them an exciting assignment, they went from D and F students to A and B students.

Yes, I occasionally had trouble with these mavericks. On more than one occasion, they broke into the time-sharing system that we were using (which was in North Carolina) and "explored" the hard drive. They may have been the first hackers but they all were good kids who just needed a pat on the back and an opportunity to do something in which they took pride. I gave them these things, and they gave me outstanding products. I am proud to say that all of them graduated (some with honors), and all had companies lined up at the door eager to hire these "misfits."

Repairing Computers—and Confidence

Here's a good example of what technology can do for students when they get involved in projects such as SWAT (Students Working to Advance Technology), the brainchild of a past Teacher of the Year, Lucy Miller. This story was supplied by Wynde Brady, a technology assistant and SWAT advisor at Madison Elementary School in McLeansville, North Carolina.

Dennis is not a top student and is having difficulty finding his place in school. He wants to feel needed, so I found a place for him on the SWAT Team in a position that would let him fill the role of a helper. He was assigned to the Central Unit and comes to "work" at 7:30 each morning.

In his role, Dennis is responsible for six Macintosh computers at our school. He takes his duties very seriously. He keeps the computers clean, rebuilds the desktops when necessary, and lets me know if the teacher is having any problems with them. Dennis's job is finished at 7:55, so he does not miss any classroom instructional time, which is very important because he still learns more slowly than other students. He knows that he is a valuable member of our SWAT Team, and this sense of belonging has been a huge confidence-builder for him.

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- Lists of top TV resources that Discovery recommends
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Discovery Channel SCHOOL

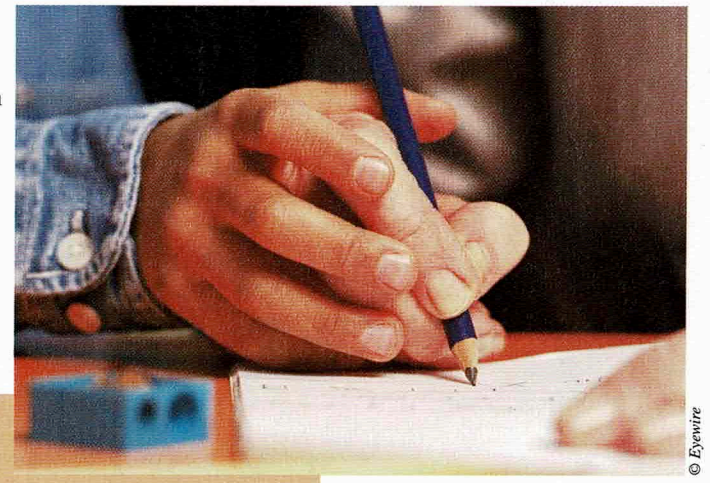
Sharing the Gift

Sometimes technology—and the impact it has on students—can prevent a misdiagnosis. Here's an example from Bonnie Bracey, a former teacher, long-time technology user, and consultant in Washington, D.C.

When I was teaching fifth and sixth grades several years ago, I had a student named Paul. He had been considered a difficult student up to that point because of his aggressive behavior and his resistance to doing his assignments. His teacher from the previous year had recommended Paul for a special education placement, but the process of evaluating him and developing an IEP had not yet taken place.

At that time, the Internet was in its early stages, and the only thing available to us was Prodigy. Paul decided to enter an essay contest about the future, sponsored by Prodigy. He chose acid rain as his topic and did his research using traditional resources, software, and the resources on Prodigy.

Paul was clearly enthusiastic about using the technology, and for probably the first time in his school career, he stuck with something. Even so, it was a struggle. He knew what he wanted to say, but he was an abysmally slow writer, often becoming frustrated, but persisting. He put together a wonderful report that he wrote painstakingly by hand while I watched—the principal wanted to be sure it was his work and that he received no outside help, as specified by the contest rules. He finished the report on the last day of the contest, and I got a speeding ticket trying to get it to the post office on time.



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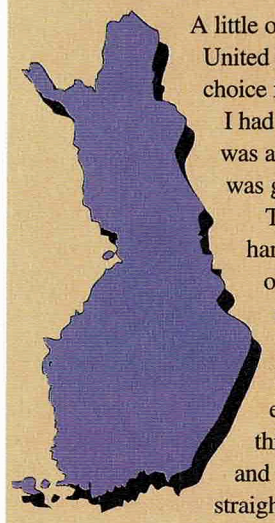
No one was more surprised than Paul when he won the contest, earning an IBM computer for himself, a Macintosh for the class, and free access to Prodigy for anyone in the class who had a modem. This success absolutely changed Paul's life. It gave him both direction and confidence, and subsequently, he learned how to use a word processor. This finally allowed his composing to keep up with his thinking, and we discovered that Paul was actually gifted, not developmentally delayed or behaviorally disordered. Today, Paul is in college at a prestigious university in the East, and everyone who knows his story recognizes that technology gave this struggling young man the tools he needed to demonstrate his talents.

Rising to the Occasion

As any teacher can tell you, technology works best when it is integrated into the curriculum. Learn from former Teacher of the Year Chuck Drake (Prince William County, Virginia) how a technology-centered event changed the way a girl viewed school.



A little over two years ago, a group of us were chosen to represent the United States at an international conference in Helsinki, Finland. My first choice for a student participant could not follow up on the work needed, so I had to pick an alternate. Karen, a ninth-grader, was a hard worker, but was actually behind the other students in many ways. The only way she was going to be able to participate was to play catch-up very quickly.

This once-in-a-lifetime opportunity set a fire under her; she worked harder than every other student. Not only did she help put together our project presentation, she was tremendous at fundraising, helping us raise over $7,000.

Karen ended up being the hit of the conference, hosting events and networking with everyone. She just blossomed, and it didn't end there. Last summer Karen helped raise money for another trip—this time to Costa Rica. She did most of the writing for our school, and was again the most knowledgeable and prepared student. She is a straight-A student now and wants to major in environmental studies.

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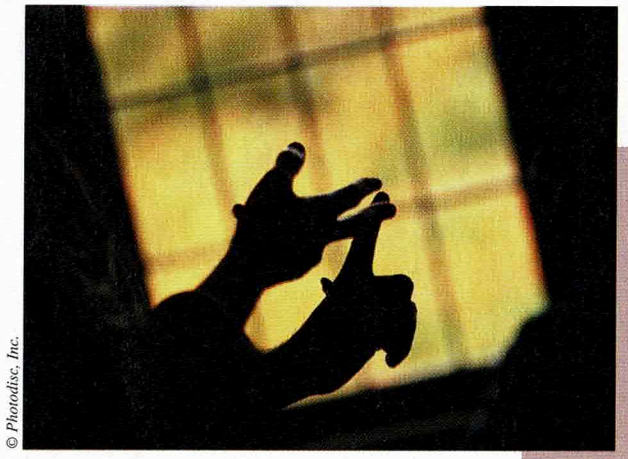
In Search of Magic

Even longtime technology enthusiasts like Al Rogers can remember moments when computers seemed to be little more than fun playthings. But then there were the other moments....

When I deployed my first Apple II+ computer lab in 1980–81, MECC's Volume 7—with *Oregon Trail*, *Lemonade*, *Odell Lake* and other great programs—were big favorites with all the kids. However, those nifty programs would only go so far, so I "filled up" the remaining time with teaching fifth- and sixth-graders BASIC programming. While we were all game to do this, and there was lots of excitement about these new personal computers, it was still somewhat of a stretch to see the value in learning BASIC.



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I was enthusiastic when Logo came out in 1981. We discovered how to assign different shapes to the turtle, which allowed us to animate our Logo worlds—rather primitive, but nevertheless filled with all kinds of meaningful discovery opportunities for students. It was during this time that I discovered the power of the phrase, "Wow...how did you do that? Show me!"

While Logo was a definite improvement over BASIC, it was still a long way from being a practical application that would get people excited. Far too quickly Logo became a subject to be mastered rather than a medium in which to explore, discover, and learn. Then in 1983, we got *Magic Window*, our first word processor. Suddenly the light bulbs lit up and we all—teachers and students—saw ourselves becoming writers. That was a heady year for me, and one which set me on the path of promoting the computer as a tool in the classroom to foster, facilitate and promote effective communication and understanding.

In 1984, CUE Softswap recruited me to contribute to their collection of free software, so I embarked on the development of *FrEdWriter*. We were particularly proud of its prompted writing feature, which allowed teachers to develop writing scaffolds for beginning writers. That same year also saw the earliest tests of *FrEdMail*, which grew and evolved over time into the Global Schoolhouse (**www.globalschoolhouse.com**).

The discovery of tools (*Magic Window*, *VisiCalc*, *PFS File*, and Beverly Hunter's book, *My Students Use Computers*) set me on an irreversible path. From the time I first saw my students becoming writers, I realized that computers in schools would be most successful and accepted when they were used in the same ways that businesses were beginning to use them: as levers for the mind.

Finding the Right Tool

Sometimes technology is more than a series of small steps—it's an outright miracle. This example, sent by Jan Van Dam, director of new media at Oakland Schools in Michigan, is just such a story.

About 10 years ago, I met a fourth-grade girl who made an enormous impression on me. Sandra was new to one of the schools in our county and completely uncommunicative. Whenever she was expected to interact with her peers or an adult, she engaged in self-mutilation behaviors. She was later diagnosed with an emotional disorder, but at that point, she was in a regular classroom and was not receiving special education services.

Sandra slowly learned how to use a word processor to communicate with peers and teachers. Soon, she began speaking short phrases, but her chief means of communication remained the computer. I didn't have many opportunities to interact with Sandra until about two years later when a crew was coming in to videotape some students engaged in the writing process. Sandra came running up to the teacher and volunteered to help. I almost fell over when I heard her speak.

Not only did Sandra want to participate, she wanted to tell the video crew how to set the whole thing up. She wanted them to see how she used the writing process, edited her work, and interacted with her classmates in the peer review process. When I spoke with her about how she had changed, she answered, "I found a tool that I could use!"

Sandra moved out of the district the following year. When she left, she was a relatively well-adjusted child who no longer reverted to self-mutilation. She remained in touch with her friends through letters and e-mails, and at last contact, seemed to be doing well. That was a decade ago, but I'm hopeful that she was able to keep her life together and make a successful transition to adulthood.

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A Company Is Born

Two decades ago there were no big-name educational software companies—just beginning programmers and educators looking to make a difference. Here's the story of the first days of The Learning Company, from Teri Perl, one of the company's founders.

It was 1980 and I had just returned to California from a post-doc at the University of Wisconsin. Ann McCormick, then Ann Piestrup, had learned that she was probably going to be funded by two federal agencies (NIE and NSF) to develop programs in logic and geometry for second- and third-grade children. The person who had been written into the grant as the math expert had just opted out…and so Ann was short a math person. That was me.

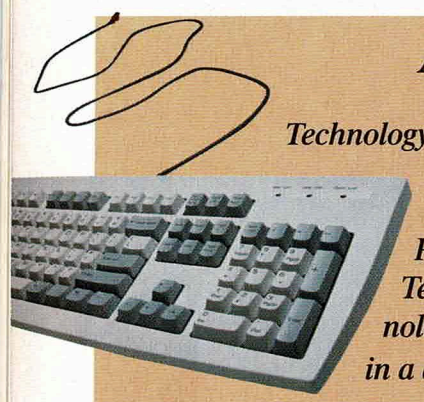
Advanced Learning Technology (that was our first name) was born in a one-room office in Portola Valley, California. The location seemed to portend success since the office next door had just been vacated by an expanding Mrs. Fields Cookies.

At about the same time, Warren Robinett appeared. He had recently left Atari, where he had been the designer and programmer of one of the company's first popular computer games, *Adventure*. To "prove" himself, Warren went off into his garage for about a week and returned with the "rooms" environment that was the innovative setting for our earliest programs: *Gertrude's Secrets*, *Gertrude's Puzzles*, and *Rocky's Boots*. It was an environment that made people sit up and notice.

Shortly into that year Leslie Grimm appeared. She had just gotten an Apple II computer and taught herself to program. Not that surprising. Leslie was smart. She had a Ph.D. in biology. As a mother of two young daughters, she was working as a teacher's aide and designing and programming learning games for young children on her own time. *Bumble Games*, *Bumble Plot* and the *Moptowns* were programs developed by Leslie at that time. (Later on Leslie was to become the mother, creator, and designer of that world-famous character, *Reader Rabbit*, and I would tag along with *Math Rabbit*.)

After that first year, venture capital gave us the wherewithal to become proper software publishers. I remember people sitting around trying to come up with a decent new name for a company that was about to launch software for kids. Advanced Learning Technology would definitely not do. The best we could think of was The Learning Company. No one was thrilled with the name, but we figured it would do for the moment. Little did we know…!

A Second Chance



Technology sometimes stirs the most unusual interests, which in turn can make an enormous difference in a student's life. Here's a story, sent by Pamela Morgan of the Office of Instructional Technology in Newark, New Jersey, about technology, the Wild West, and a troubled young man in a difficult situation.

Like many boys with behavioral problems, Andy had a consistent track record of academic failure. He was considered a nonreader and had concomitantly poor writing skills. Andy's school difficulties were affecting his home life because his parents truly wanted him to succeed.

The change in Andy began when he learned that he could compose and write more easily with a word processor. His skills with a word processor and other application software improved to the point where he could tackle *HyperStudio*. At the same time, his attitude toward school began to improve, and he was beginning to take a greater interest in reading.

For whatever reason, Andy decided to create a *HyperStudio* presentation with a Western theme based on talking dogs and cats. He wrote the script himself, enlisted the help of his classmates to create the voices of the characters, and integrated these sounds and his own graphics into the presentation.

Near the end of the school year, Andy presented his work in the technology lab, which had been set up with additional seating. In addition to his classmates, Andy's ailing mother and her nurse attended, as well as other family members, the building administrator, computer teacher, and instructional technology supervisor. Andy was dressed to the nines and wore his best lime-green suit and matching lime-green suede shoes.

Andy did a fabulous job, even overcoming a technical problem with a corrupted file. Andy's family and friends, as well as the school personnel, now saw him in a completely different light, and it was just as clear that he had gained a new level of self-respect. Andy's goal is to build a career in the development of multimedia presentations, and in order to meet this goal, his attitude toward school has changed completely. Many challenges still lie ahead for Andy, but thanks to technology, he's been given a second chance to build a meaningful life.

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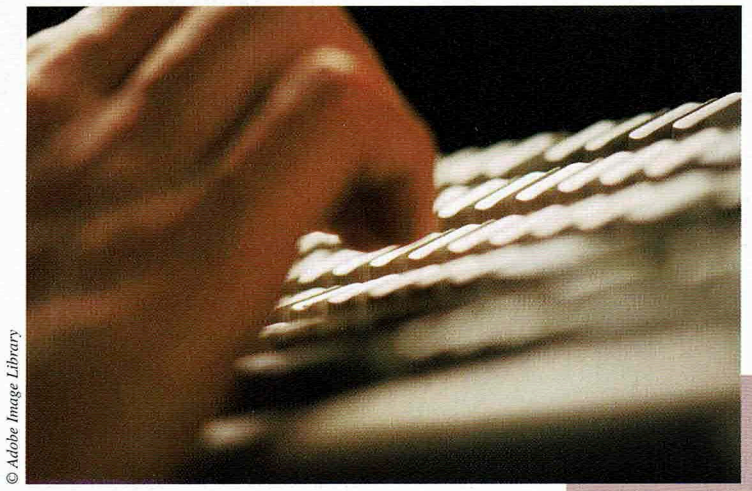
Starting With a Typewriter

In this story from software developer Dave Middlebrook, you will learn how technology served not only as a catalyst to turn his life around, but also as a tool to make a difference for others in his situation.

I didn't exactly embrace computer technology from the get-go. I wasn't a Luddite, it was more like, "Why should I bother? This just looks like more work." But that was before I was diagnosed with ADD and learning disabilities. There's a long story about how that all came about—involving my previous career as a stone and tile flooring contractor; my desire to do something more intellectually challenging; deciding to apply to law school; acing the LSAT; trying to reconcile the discrepancy between my LSAT score and my poor grades; and finally getting in to the law school at DePaul University in Chicago. The main thing is that when I got to law school and was completely overwhelmed by the sheer volume of reading, I had a change of heart about computers. I was forced to come to terms with the fact that, on my own, I was never going to be able to read as fast or as well as I wanted to. Computer technology was what I needed.



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There's one additional note. Although it took my law school experience for me to embrace "computer technology," you could say that I had taken the first steps, many years earlier, to becoming the technophile that I am today. The technology that first made a difference to me was the typewriter—a form of "writing technology."

It helps to know that I have a pretty severe problem with "dysgraphia"—which makes it extremely difficult for me to write by hand for more than a few minutes. My folks didn't know about dysgraphia, but they were smart enough to see that I had a serious problem with writing by hand, so they had me take typing lessons when I was in middle school. And I was lucky that my teachers, although they didn't know about dysgraphia either, quickly caught on to a simple pattern: Make Dave take tests with a pencil, and he will fail. School policy did not allow for taking tests on a typewriter, but they did let me use a typewriter to write an outside paper for every major test that I failed, so I never flunked out.

Over time I have come to realize that technologies can be things that I build myself, for myself. That was an important realization that still drives me today. I dropped out of law school nine years ago in order to build a software toolkit that would help me read. While I am frustrated that the implementation of this dream has taken so much time and energy, I believe that I will succeed—because with technology, I have the tools I need to build the tools that I need. Technology is my ticket.

Budding Authors

Like many teachers, Caroline McCullen was swept away with technology because of the way her students responded to it. Here's how this former Teacher of the Year describes the birth of one of the first student-created "webzines," MidLink.

The whole world changed for me one day in 1994 in a classroom at Discovery Middle School in Orlando, Florida. My students and I were crowded around a computer monitor as we crawled around the World Wide Web on a 1400-baud modem using the then-state-of-the-art browser, Mosaic. We were thrilled beyond our imaginations as pictures and text gradually appeared on the screen.

Matthew, a child who was rarely enthusiastic about anything academic, inched closer to the computer. He wanted to see what all the excitement was about. As he drew close enough to get a good look at the screen, he shouted, "Look! That's the Great Wall of China!"

As we continued to browse, Erika looked up at me and asked, "Who makes all this stuff?" Before I could answer, she said in disgust, "WE could do better than THIS!" That was the beginning of *MidLink* magazine. Our first "article" was called "Global Skylines" and can still be found in the *MidLink* archives at: www.cs.ucf.edu/~MidLink/skyline.home.html.

www.nytimes.com/learning

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The ultimate hot link between your classroom and the world.
www.nytimes.com/learning

The New York Times on the Web Learning Network

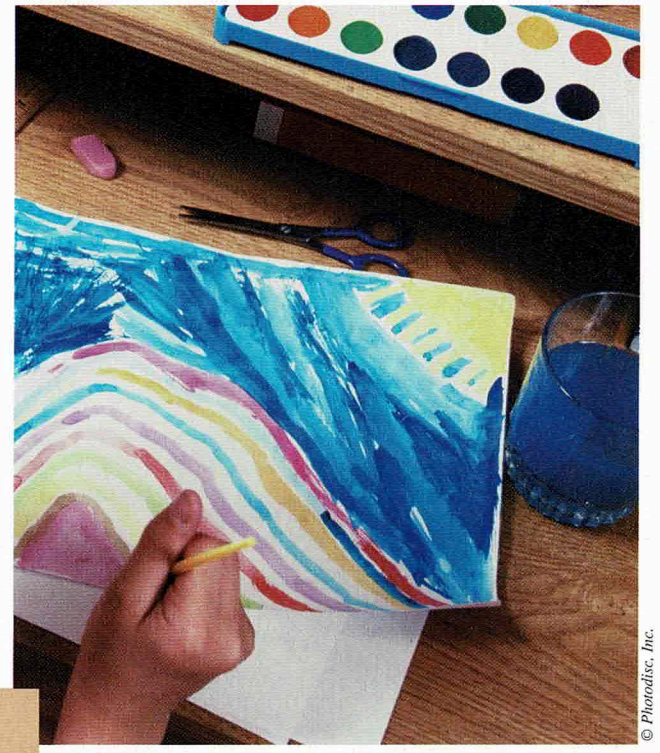
Learning to Love Words

Small victories can occur in the simplest circumstances. Here's a story, sent by Caroline McCullen, about how some yarn, cardboard, and text from a word processor changed one young man and his peers.

Dion, an eighth-grader, had dark eyes that sparkled, especially when he talked with his friends. Each day as class began, however, the sparkle left his eyes. The tiny wrinkles between his dark eyebrows began to deepen as he puzzled over the words in his library book. Free reading time for him was torture, because he struggled with each word. Dion, like the other students in my Chapter 1 reading class, was well below grade level. My primary goal was to get these students to view reading as a pleasurable activity, but most still saw it as something to be endured.

In 1985, computers were so new that I had barely begun to realize their potential, but one day stands out as a landmark for me. After weeks of editing and revising their stories, each student had selected his best work to be "published"—printed from a word processing file and placed in the class story collection. We sent our collection to the central office to have a copy made for each student, and now the big day had arrived: the copies were back and we were binding our books.

Each student had designed an original book cover with markers, construction paper, rubber cement, and cardboard. Today, we would punch holes in the copies of our stories and sew them into the covers with a few strands of brightly colored yarn. I was moving among the students, helping with the hole-punch or the yarn, when I noticed an unusual stillness in the classroom. When I looked up, I saw that the students were flipping through the pages and reading—voluntarily! They were looking for their own stories, but they were also discovering stories written by their classmates. I paused to enjoy the moment.



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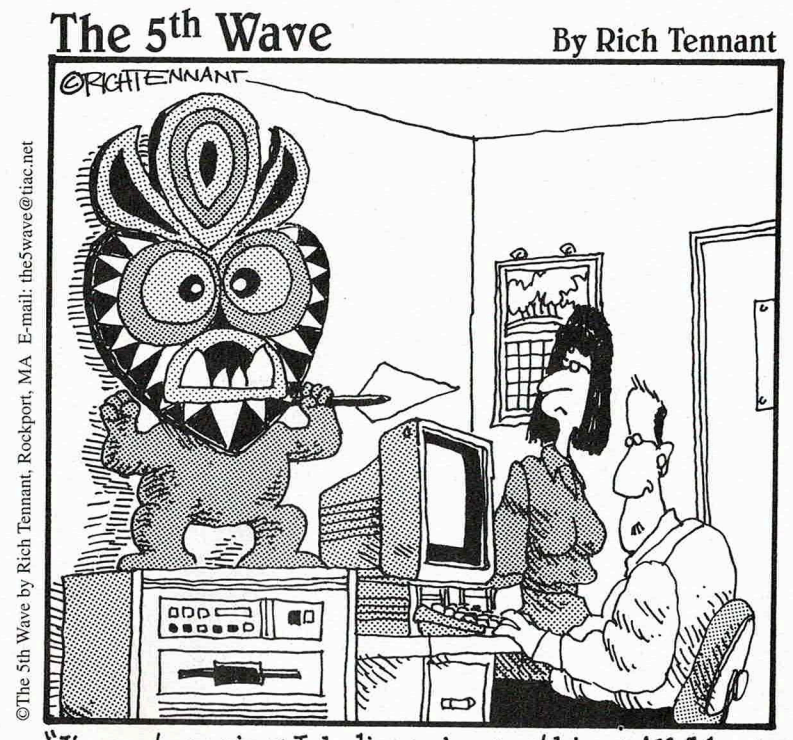
They were not only reading, they were responding to the words. Michael pointed to a page and urged his neighbor, "Read this. It's really good!" Dion, the proud student author, straightened in his desk and glanced around to see if anyone else had noticed his work. For the first time, his eyes sparkled in class the way they had with his friends. Suddenly everyone was looking at the printed page in a different way. These colorful books contained interesting ideas they could understand, not just words. Did we create fine literature? Hardly. But with a computer, a printed page, and some yarn, we did manage to change some attitudes. And that may have been a finer accomplishment.

Gainfully Employed

Here's a story from Randy Allen, director of technology for Gahanna-Jefferson Public Schools in Gahanna, Ohio, and* Technology & Learning*'s first National Teacher of the Year.

There are countless examples of students who went through our program and then were hired right out of high school in well-paying technology related jobs. One example is George, an "average" student who had a knack for technology. George took every class we offered and hung around the computer labs as much as he could during his high school career. He became so good at working with technology that we hired him to help keep our district up and running. We were not able to keep him long, however.

One day, he was listening in on a conversation I was having with one of my vendors and offered up a suggestion. The vendor was so impressed with his knowledge that he offered George a job that afternoon. Three years and a college degree later, he is now making more money than I am, and I've been an educator for 22 years.



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"I'm not saying I believe in anything. All I know is since it's been there our server is running 50% faster."

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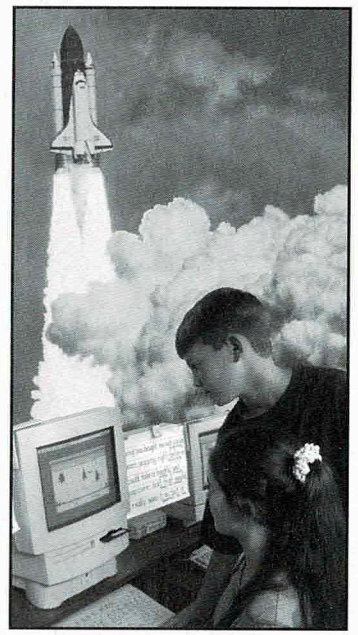

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Coming Attractions

From portals to "snortals," literati to digerati, wires to thin air, technological transformation waits for no one. In the following pages, tapped-in techies eye trends for the millennium and predict their impact on education.

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Education in the Future: A Shifting Paradigm

How will we live and learn in the new millennium? What traditions and practices will we leave behind? In their upcoming book, Windows on the Future: Education in the Age of Technology, *educational evangelists Ian Jukes and Ted McCain explore the forces of change in our lives and the role technology will play in reshaping education.*

1 *Education will not be confined to a single place.*

For the last 150 years students have gone to school. However, this is not the way it will always be. This may come as a real shock to many of our colleagues who have spent most of their career teaching in a classroom. The development of a global digital network of fiber optic cable and wireless communications using satellites and cellular telephones will fundamentally revolutionize the concept of travel. Literally anyone will be able

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to access this network from anywhere using personal, pocket, wireless, tiny-tech communication devices. We are already seeing the first signs of this today.

2 *Education will not be confined to a specific time.*

Personal computer communication devices will also break the time barrier for learning. School will no longer be over when the bell rings at the end of a period or end of the school day. The school day and school year will no longer be predicated on the 180 days a year, 5-1/2 hour day that is a remnant of a time when children were needed in the fields during the summer to help harvest the crops. Using the new technologies, students will be able to access learning materials 24 hours a day, 365 days a year. This will have a major impact on learning because it can be primarily driven by need and/or interest.

3 *Education will not be confined to a single person.*

Traditionally, a single teacher was the sole source of teaching in the classroom. However, when students have access to technology and information anytime they need it, *who* they learn from will radically change. The instantaneous access to people and information will allow students to communicate both locally and globally for instruction. Parents will be able to assist in home-schooling their children whether they are at home or not. Students will be able to contact community and political leaders, business owners, scientists, and a variety of experts from many fields, as well as traditional school personnel such as teachers, librarians, counselors, and others from wherever they are.

4 *Education will not be confined to human teachers.*

As students gain access to a wide variety of teachers, it is a certainty that some of them will not be human. This idea will make many of the over-30 crowd feel very uneasy, but the Nintendo generation, who have never had a time in their lives when such technologies haven't existed, will take to this like ducks to water.

5 *Education will not be confined to memorization.*

Academic success in the Industrial Age was based on a student's ability to memorize facts. People who could suck up and regurgitate information on demand were highly regarded and rewarded. However, this kind of intellectual and informational bulimia does not adequately prepare a person for the Information and Communication Age that we live in. The day when all the information that existed could be stuffed into a person's brain is long gone. As the amount of information continues to double, academic success will depend less and less on rote learning, and more and more on a student's ability to process information and use it in a discerning manner.

6 *Education will not be confined to paper-based information.*

Technologies that bring the world into our homes will soon allow children to wander through the pyramids, to visit Saturn,

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to see chemical reactions at the atomic level, as well as to participate in real-time teleconferencing. None of these experiences will involve paper, but all will involve learning.

7 *Education will not be confined to linear learning.*

Linear learning is compatible with the assembly line model. Learning is done left to right, top to bottom, beginning to end. This is a lineal, logical, sequential model. With the introduction of new technologies, however, the learner can start an information expedition in the middle of the material and move backwards or forwards through the information as needed. As technology creates an interconnected world, people can construct their own learning webs and personal pathways. They can learn what they need, when they need it, without the interference of unnecessary and irrelevant information.

8 *Education will not be confined to the intellectual elite.*

Until recently, the real power in our country was in the hands of the "literati"—the people of paper. Increasingly, that power has been transferred to the "clickerati, mouserati and digerati"—people such as Microsoft's Bill Gates, the 90-million-dollar-a-day man. This is because they have developed smart devices that bridge the gap between humans and technology. As a result, technology has become the great equalizer, allowing ordinary people to do extraordinary things.

9 *Education will not be confined to childhood.*

In the past, when information had a much longer shelf life, learning was something that was done once in your youth. Then you were done with learning for life. In the "good old days," what you learned in your youth prepared you for your single career. Today, learning has become a lifelong process. Given the rapidly changing nature of our world, people of all ages must constantly learn and relearn what they need to know, What they learned yesterday may no longer be valid in tomorrow's world. Tomorrow, they will have to learn again, because today's information will already be out of date. Embracing lifelong learning will be a personal and professional imperative for life in the 21st century.

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10 *Education will not be confined to controlling learners.*

In the industrial era, the traditional educational mindset used a predetermined, predefined, generic cookie-cutter curriculum, which led to a "one-size-fits-all" approach to learning. Unfortunately, this approach did not work for many people. Using this perspective, we thought there must be something wrong with the people who didn't fit the system. Today we understand that we must customize the learning to the individual, because different people learn in different ways and at different rates. ❖

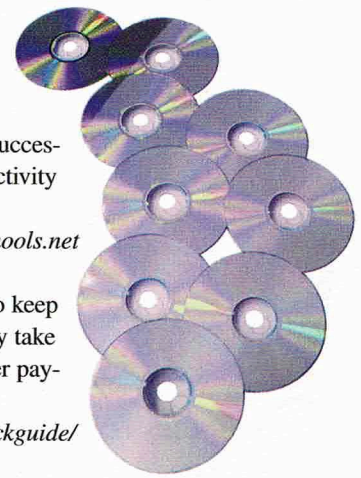
Ian Jukes is associate director for the Thornburg Center for Professional Development and co-author of NetSavvy: Building Information Literacy in the Classroom, *to be released by Corwin Press in February.*

Ted McCain splits his time being a teacher and computer consultant in the Maple Ridge School District in Vancouver, B.C., and being an associate director for the Thornburg Center for Professional Development in San Carlos, Calif.

Reprinted from Chapter 8 of Windows on the Future: Education in the Age of Technology *with permission from Corwin Press, Inc. (www.corwinpress.com). Parts of the chapter have been edited for length. Available fall of 2000.*

Trends and Predictions

Content Delivery



"In 10 years, CDs and DVDs will be dead and content will be delivered through the Internet and its successors. The reason is that CDs don't scale up—you can't give every kid in the school every CD. Connectivity will render them moot."

— Tom Greaves, vice chairman, NetSchools; www.netschools.net

"The Internet can go two ways. The current model of advertising-based, free services may continue to keep the Internet open to all. However, I feel that the subscription model—paying for quality content—may take over. Another thing that may happen, in the wake of Internet2, is free Internet access, but with the user paying for the amount and type of information that is utilized."

— Kathy Schrock, Kathy Schrock's Guide for Educators; discoveryschool.com/schrockguide/

"Many of the topics that will interest children will remain the same but the depth and breadth available to them will increase. Speed of delivery will drastically improve the use of video and simultaneous translation of content, both sound and text. Artificial intelligence will play an important role in both virtual and simulated environments."

— Jenny House, vice president for strategic relations, Classroom Connect; www.classroom.com

Crossing Boundaries

"The operating system is more of a placeholder for the key issue in the future: user interfaces that know who we are, understand via artificial intelligence what we want to accomplish, and are actively assisting us in the gathering and processing of huge amounts of information. In distributed learning situations, the underlying OS shouldn't matter one byte, so long as it allows applications to run on top of it. Anytime the technology forces us to think about it, rather than about what we're doing in a learning situation, it has failed us."

— Pedro Hernández-Ramos, director of market development, IMS; www.imsproject.org

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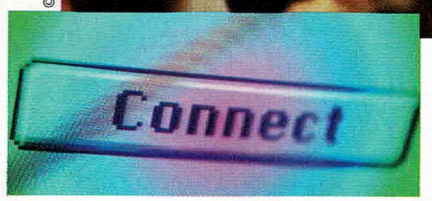


Multimedia of the Future

"Music departments and teachers will have direct, immediate access to any piece of music they would like to use in a lesson. School expenditures toward building music collections will no longer be necessary. The potential to purchase individual song downloads rather than full albums will also ease music department budgets."

— Cal Reichenbach, editorial manager, Liquid Audio; www.liquidaudio.com

"Experts predict that within the next five years (if not sooner), we will merely dictate phone numbers and addresses into our personal digital assistants, instead of typing them in. We'll ask our house to turn on the light for us (no clapping necessary!) and casually tell our computer to download the front page of the *New York Times* and print it. We'll ask our cell phone to call the doctor; our car to tune the radio to NPR; our VCR to record the next 'X-Files' episode. We won't need a keyboard, stylus, mouse or even our fingers—just a mouth."

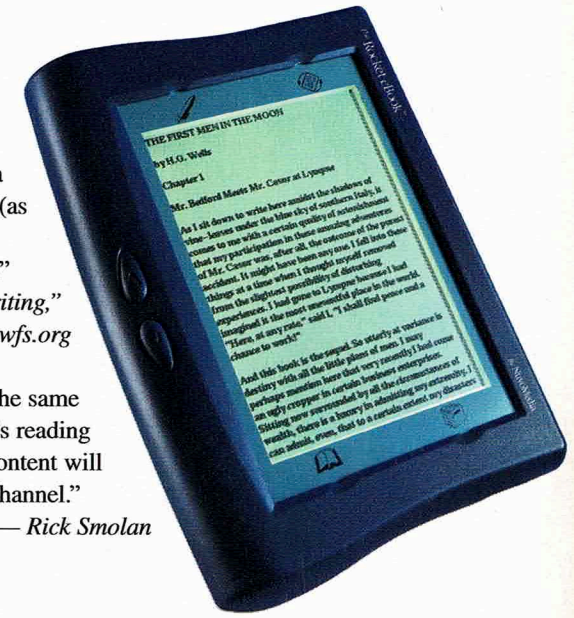
— Janelle Brown, "Talking 'Bout a Computer Revolution," Oct. 29, 1999, Salon; www.salon.com

"If teachers in California want to give kids a scent of what it would be like to live on a farm in the Midwest, they could broadcast that scent to the classroom. In science class, students could smell certain kinds of trees and flowers. It would come right through the PC, a peripheral or through a 'snortal' site where people can create and register their own scents from a database of smells."

— David Libby, manager of public relations, DigiSense; www.digisense.com

Trends and Predictions

The New Books



"By 2005, the bookpad will cost about $20, weigh no more than six ounces, reproduce text with greater clarity than ink-on-paper, and be able to store an encyclopedia (or 500 novels) on a single chip…. By 2070, the only people using text as literature (as opposed to information transmission) will be an elite and mostly very elderly priesthood, for whom it will be an arcane art form—sort of like the sonnet or haiku today."

— Geoffrey E. Meridith, "The Demise of Writing," The Futurist*, October 1999; www.wfs.org*

"Everyone will own just one book. It will be the thickness of *Time* magazine with the same flexibility. Instead of staples down the spine there will be a thin cord that downloads reading material. It will feel like paper but a current will run through it. Plug it in and the content will show up on the paper. When you're done, it will be gone, just like changing a TV channel."

— Rick Smolan

Technology Literacy

"Sixty years ago, they had radio labs and they taught students about AM, FM, kilohertz, volume, tuning, antenna placement—and they called this radio literacy. Today, nobody thinks much of teaching this because kids somehow absorb this before they're 4. The same thing will happen with computers. States' technology standards will be completely gone by the end of the decade. And we'll laugh about it. Because teachers will all have had computers at home and they won't need to know all that stuff. Every student will have had a computer for quite a while."

— Tom Greaves

Reader Predictions for the Year 2020

1. ***Computers will be used just as often as pencils are today.***
2. ***Every student will own a laptop computer with lightning-fast connections.***
3. ***Students will use wireless, pocket-sized computers that look like cordless phones.***
4. ***Voice recognition will overtake keyboards.***
5. ***Kids will surf the Web through watches and necklaces.***
6. ***Students will be able to attend virtual reality cyberspace classes from home. Those without home supervision will go to a local technology center.***
7. ***Schools will look more like laboratories and libraries, with teachers carrying out research and students participating where their interest leads them.***
8. ***Kids will be smarter than ever and adults will have to work harder to stay ahead of them.***

From the *Technology & Learning* Millennium Survey

Trends and Predictions

Stay Tuned

"There's been a lot of talk about interactive television, but it just hasn't happened yet. When it does, there will be a dramatic integration of TV with computer tasks like surfing the Web and doing e-mail. Right now, bandwidth stands in the way—people don't have the patience to deal with slow connections and poorly rendered graphics after having the pleasure of watching TV. DSL and cable modems are starting to solve this, but in the future, there will be a much better way to connect, and your satellite dish, set-top box, and personal video recorder will all be in the same box."

— Laura Lindhe

Image Is Everything

"I saw a large display at Princeton that was 30 feet across and 12 feet high, the size of a front of a classroom. This display was so good that if you stood back, you saw a field of flowers. Get closer, you see a bug. Walk up closer, you see a ladybug. Today that type of projection and graphics costs $200,000. How many schools are going to spring for that? In ten years, however, they'll be able to buy it for $1,000 or $2,000."

— Tom Greaves

"Microdisplays will have their day. The possibilities in the medical field alone are plentiful enough to keep the research and development cooking. Doctors may soon have head-worn displays that show vital information while in surgery. And who knows, there may be a profitable niche of consumers out there who want their cell phones to have flip-up peepholes so they can see their e-mail on a screen while they drive. We just don't want to be anywhere near them on the freeway when they do."

— Chris O'Malley, "Microsize Your Monitor," Oct. 25, 1999, CNET; www.cnet.com

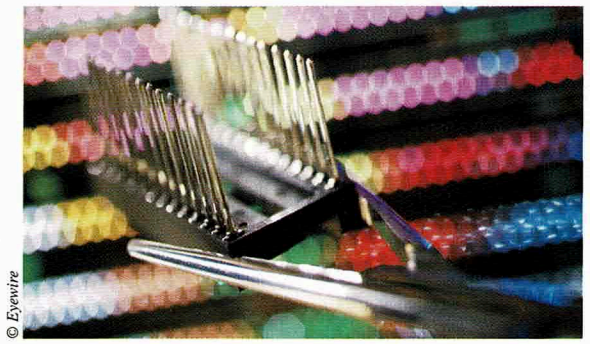
Photo courtesy of The MicroOptical Corp.

Double vision? When connected to a computer or electronic device, these eyeglasses also function as a microdisplay.

To Infinity and Beyond

"Ten years from now, schools will have virtual reality labs in place of computer labs. Kids will go to Mars. They'll explore the ocean. They'll visit the rain forests and go on safaris. They'll also be able to see and smell and touch and feel these things in a very realistic way."

— Tom Greaves



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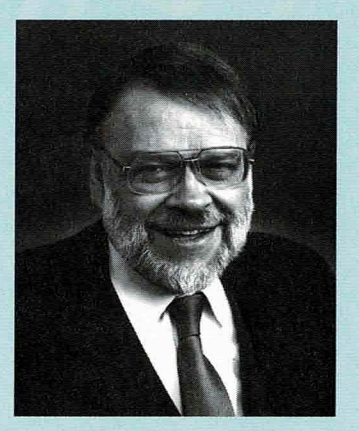
"We'll have a way of knowing where we are at all times and where all our possessions are—our socks, our pants, our car will have a computer chip in it. The Humane Society already has a computer chip they put under the scruff of a cat's fur to identify it. In five to 10 years, hospitals will offer parents the option of a chip installed in their baby so you'll never lose it. On the flip side, it's a huge privacy issue: imagine everyone knowing where you are at all times—your parents, your boyfriend, your teacher."

— Rick Smolan

Technology in Future Tense

David Pearce Snyder is lifestyles editor of *The Futurist* magazine and former consultant to the RAND Corporation. A social forecaster, he has published over 100 studies, articles, and reports on the future of a variety of institutions, industries, and professions.



At what point are we now in the "Information Revolution"?

It generally takes two human generations—70 to 80 years—for a new technology to evolve from its first practical demonstration to general adoption throughout society. During about the first 50 years of this period, the new technology remains so costly and unreliable, and so incompatible with existing systems, that it actually drags down economic performance in a nation. Once a new technology has matured through a half-century of research and development, it typically produces an explosion of productivity and prosperity. Since the computer turned 50 in 1996, we have already begun to experience a cornucopia of high-tech innovations that will not only give rise to soaring productivity and prosperity, but also dramatically alter how, where, and with whom we work and play.

What will ubiquitous computing look like in the classroom, in the home, in the workplace?

Within ten years, nearly all American adults—and most students—will own a Personal Digital Appliance (PDA), a device combining the features of a cell phone, pager, PalmPilot, and a wireless Internet terminal. By 2010, PDAs will outnumber PCs, and will be many people's only computer. Too small to contain substantial memory or data processing internally, PDAs will rely upon the Internet for their computing power and data storage. Too small for more than a minimal visual display, PDAs will routinely tap into flat wall-screens in most homes, offices, and schools. And too small for a really useful keyboard, PDAs will make use of voice input. Within five to seven years, oral interaction with all electronic devices will be commonplace.

How will this carry over to teaching and learning?

Obviously, universal access to powerful and cheap technologies like PDAs will provide a whole new media realm for teacher-student-class interaction. But more importantly, to be socially and economically productive from now on, all students must enter adult life with a mastery of the basic industrial era curriculum: they must be literate, numerate and articulate. Unfortunately only 25 to 30 percent of us learn effectively in a "passive auditory mode," that is, sitting and listening to a teacher. This suggests that schools will have to adopt more effective alternative instructional methods; the most effective instructional method we know of for most people is "contextual" or "experiential" learning.

How will technology either close or widen the gap between the haves and have-nots?

Technology will close the gap in two ways. First, network computing through relatively low-cost PDAs will enable all students in public schools to access the powerful and sophisticated computational resources that will be fundamental to the "infomated" workplace. Current gross disparities in local access to technology should begin to diminish immediately as Net computing explodes into the marketplace. Second, good instructional software has proved remarkably effective at building a capacity to learn and a capacity to formal reasoning among students from economically disadvantaged settings.

Where do you think computers will have the greatest impact on our lifestyles?

Computers will ultimately improve the quality of human decisions, which will be based on increasingly better data. We'll all be using chatty cyber-assistants that will warn us when we are about to make a wrong decision and advise us on the best course of action. We'll be able to buy a wide variety of personalities for our little cyber-buddies based on cartoon characters, movie stars or historic figures. The coming collaboration between the computer and its creator holds great promise for the enhancement of realizable human potential. However, should we become so dependent on it, the result could very well be what Hans Moravec describes in his book *Robot*: that computers will eventually become smarter than humans. This is because, unlike humans, who have to be programmed when they are born, computers can accumulate data, knowledge, and insight from generation to generation. ❖

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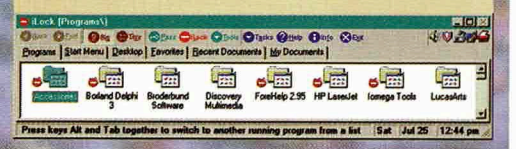

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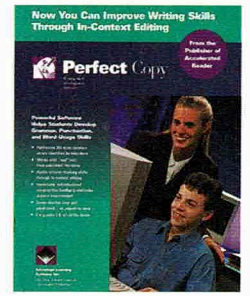

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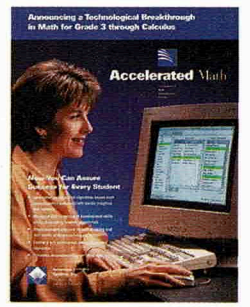

Pop Quiz

How much do you know about the history of educational technology? Try your luck with the following questions and then go to our Web site (www.techlearning.com) for the answers. No cheating!

1. Ron Wayne, an early partner with Steve Wozniak and Steve Jobs, sold back his interest in Apple Computer Company to start a coin shop. How much did he receive for his share of the business?
2. What three companies manufactured computers in the '80s built around the Motorola 68000 chip?
3. What is the typical cost of a "Y2K survival kit" for sale on U.S. Web sites, containing items like Kool-Aid and Spam, worth a total of $50?
4. How much did the first portable computer, the Osborne I, weigh, and how much did it cost?
5. What was the nickname for IBM's PCjr computer?
6. What were the five leading school microcomputers in 1980?
7. Who is Chris Whittle?
8. What does the word "Brøderbund" mean?
9. What software program honored the state of North Dakota?
10. What was the name of Scholastic's early disk-based magazine for schools?
11. What were Ink and Splat?
12. To what did Snow White and the Seven Dwarves refer?
13. How much did network bandwidth increase between 1962 and 1992?
14. The MECC software publishing company was created by the state of Minnesota, and sold in the early 1970s for $5,000. How much did SoftKey pay for the company when they purchased it in 1995?
15. What three software programs shipped with the Macintosh computer when it first came out?
16. Who was Rocky and what was he associated with?
17. What did the number 64 refer to in the Commodore 64 computer?
18. What were the three "levels" referred to when people spoke of Level I, Level II and Level III videodiscs?
19. What was not the name of a personal computer? **a**) Coleco Adam **b**) Apple III **c**) Tandy Raindrop **d**) BBC Acorn
20. What was the not-so-gentle nickname given to the TRS 80 computer?

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Dust off the old plan books and liven up your lessons with technology! The ultimate in collaborative learning, SchoolTech Expo & Conference provides a chance to see, hear and speak with those innovators who have broken barriers to implement new approaches to education. See for yourself how the educational landscape will be shaped in coming years. You can't afford to be left behind.

Where You're Motivated to Discover

Excellent teachers are those who are relentless in their pursuit of learning, those who seek fresh presentation methods. SchoolTech Expo & Conference will open your eyes and your mind to the experience of tangible technology.
Don't miss this opportunity to sharpen your vision with those who share it.

Jump Right In!

Get a head start on conference activities! Our intensive Pre-Conference full and half-day workshops make the most of registration day and heighten the SchoolTech Expo & Conference experience. The combination of hands-on lab work, lecture, demonstration, and discussion activities are essential learning adventures.

- First Things First: Planning for Successful Change
- Simple Solutions for Students Who Struggle with Reading & Writing
- Inquiry and Insight on the Internet
- Integrating the Internet into Classroom Instruction
- Weaving Your Piece of the Web: Creating Web Sites for Classroom Use
- HyperStudio Animation
- Integrating Technology into the Mathematics Curriculum
- Creating News Videos
- Designing Web Sites for Classroom Use: The Next Steps

Learning in All Styles

At the heart of SchoolTech Expo's Conference Program is the half-day workshop series. Participants will take an in-depth look at the fundamentals of technology implementation. These three-hour workshops offer a practical fusion of lab-work, lecture, demonstrations, and discussion activities. Here's our list of sample workshops for this year's SchoolTech Expo:

- Integrating Music into Multimedia: "Do-Re-Multimedia"
- Assessing Your School's Technology Program
- The ABCs of Grant Writing
- Introduction to PowerPoint: A Multimedia Teaching & Learning Tool
- Mining the Web for Elementary Resources
- Child Safety on the Internet
- Dancing on Quicksand: New Mindsets for the Information Age
- Advanced Grant Seeking Fundamentals
- Introduction to HyperStudio
- The Famous Copyright Quiz: Copyright Issues in the Cyberspace Age

Fine Tuning Your Programs

Our one-hour sessions are essential to those SchoolTech attendees involved in school-wide technology planning and implementation. Experts will give you ideas on practical solutions and insights into working curricula around the country. Present your questions for viable answers. Here's a sample of some of the spectacular subjects of SchoolTech's sessions:

THE BIG PICTURE

This sessions will be of particular interest to school administrators, as well as teachers, board members and parents involved in technology planning

- Equity of Access to Technology for K-12 Language-Minority Students
- Web Law for Schools
- Tips for Surfing the Net Safely
- Online Professional Development for Teachers
- Tips for Assessment
- Laptop Learning: A Model for 21st Century Education?
- Where the Federal Money Is
- Setting Up Technology Programs Beyond the School Hours and the School Year
- Museums Online
- What Exactly IS a Technology Director?

IN THE CLASSROOM

These sessions, designed especially for teachers and the mentors who support them, include a number of close-up case studies, as well as panel discussions, comparing and analyzing different approaches to a shared challenge.

- Technology and Reading
- All Kids CAN Write!
- Tips for Student Leadership
- Tips for Picking Out Great Classroom Software
- Nurturing Munchkin Mozarts and Monets
- Technology in the Primary Grades - How to Make It Work
- Engaged Learning: Bringing Theory, Learning and Technology Together
- Effective Use of Video Production in the Classroom
- Tips for Getting Girls Involved
- Cyber English

TEACHING WITH THE INTERNET

Also for teachers, these sessions focus on the uses of the Internet for teaching and learning.

- Enterprise Solutions
- Student Generated JavaScript Projects in Multiple Curriculum Areas
- Thin Client Computing: The Latest Applications
- Going Wireless
- Smart Uses of Smart Boards: Examples from History and Foreign Language Classrooms
- Reducing Total Cost of Ownership with Wide Area Networking
- Computing Without a Computer
- Nuts and Bolts of Digital Video

TECHNOLOGY, TOOLS & TRENDS

These sessions start with the technical details – helping participants get up to speed on current technologies and state-of-the-art products and prepare for those on the way.

- Internet Basics: Driving on the Information Super Highway
- Theater as Digital Activity
- Great Web Resources for Elementary School
- Great Web Resources for Middle School
- Tips for Finding Great Web Sites
- Creating Online (Digital) Storybooks with Your Students
- Great Web Resources for Professional Growth
- Taking Virtual Field Trips on the Internet
- The Web in the Middle School Classroom
- Online Project-Based Learning

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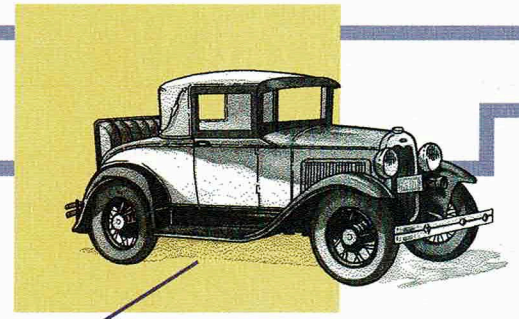
Technology Time Capsule

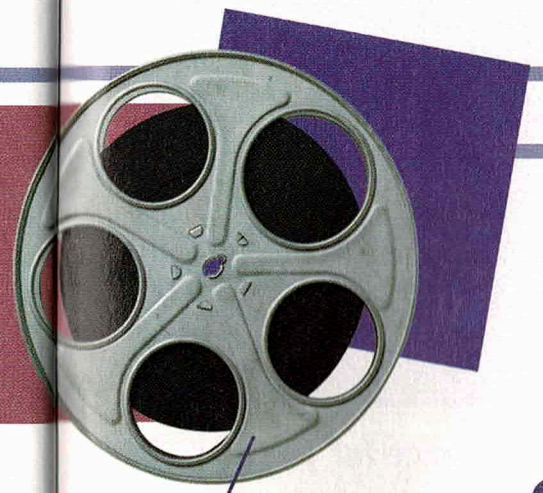
1900s

Many had tried, but the Wright Brothers succeeded in taking to the skies, at Kitty Hawk. Already, people eagerly awaited the frequent-flyer programs.



1910s

Horses were startled to find themselves sharing the road with the increasingly popular automobile.

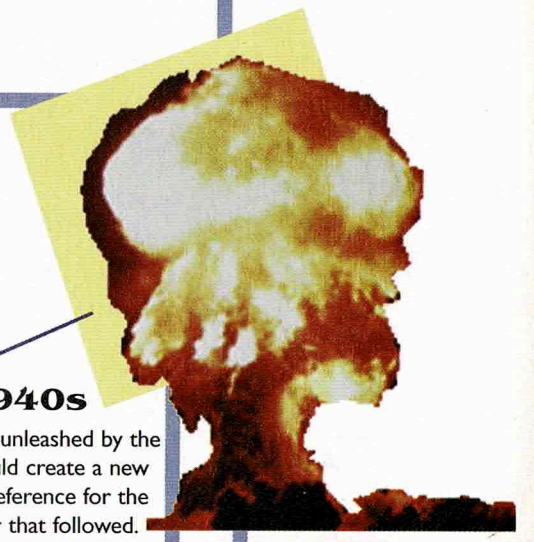


1920s

We swooned to silent movies, which in turn gave way to the "talkies" in the palatial new movie houses. And no interruptions by cell phones…yet.

1930s

On a dreary Depression day, the whole family could gather around the radio to listen to "The Lone Ranger."

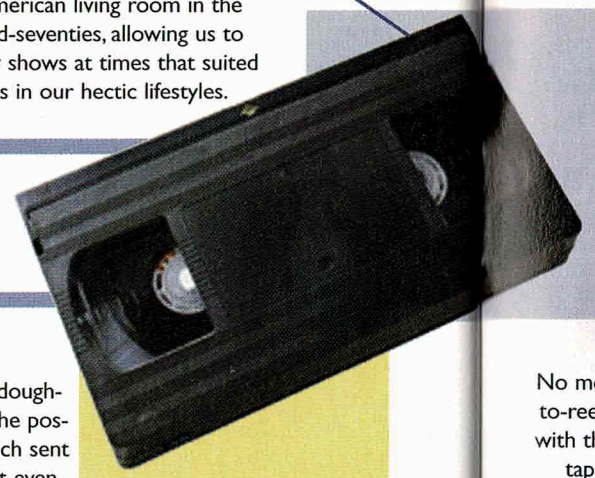


1940s

The power unleashed by the bomb would create a new frame of reference for the Cold War that followed.

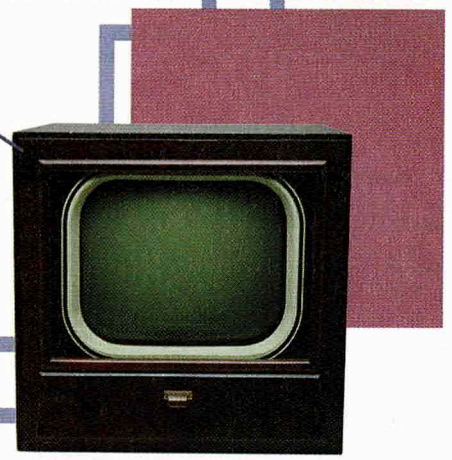
1970s

Always careful not to touch the "doughnut" center, we were amazed at the possibilities of this storage device, which sent us off in new directions we hadn't even thought of only a few years earlier.



1970s

The videotape cassette recording systems burst into the American living room in the mid-seventies, allowing us to view shows at times that suited us in our hectic lifestyles.



1950s

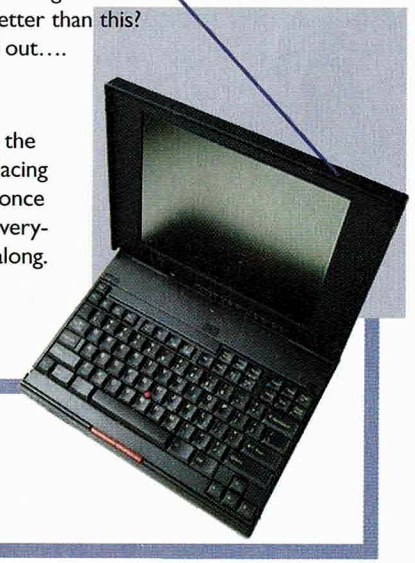
The postwar family was custom-made for the new medium of television, with regular shows beginning broadcasting late in the '40s and blossoming in the '50s.

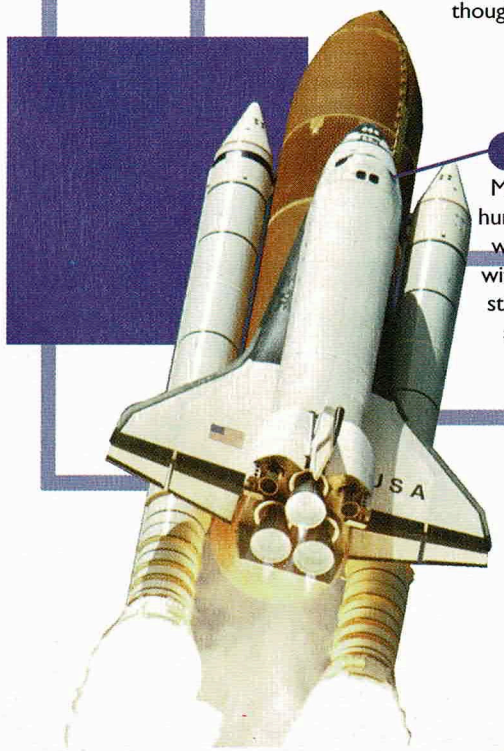
1960s

No more rewinding those reel-to-reel tapes on the Wollensak with these new-fangled cassette tapes. Were you an "early adopter" or a reluctant user?

1990s

And now we use our laptops on the plane while watching a movie. Does it get any better than this? We'll find out….





1970s

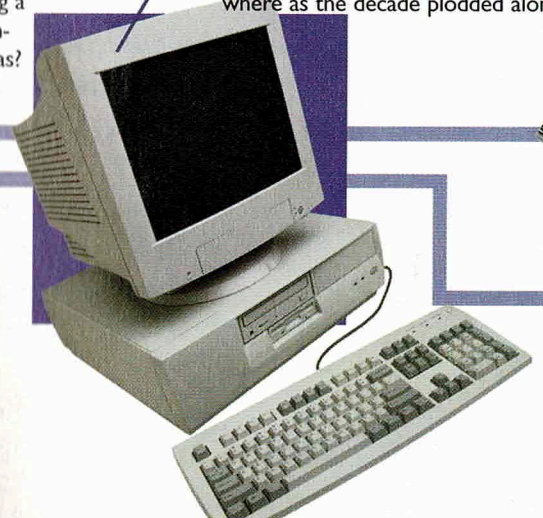
Man on the moon, ho-hum. Now space shuttles would blast into space with some regularity, yet still amaze us with data and pictures of new places.

1980s

Finally, something more familiar. Looking like a shrunken and shiny LP, the CD-ROM still is the medium du jour—but the Web is jiggling things up with its online capabilities.

1980s

What on earth did we do before the fax? But still, it's hard to send a Singing Telegram across the wire. When did you stop asking a company *if* it had a fax and instead ask what the number was?



1980s

As the decade plodded along, the desktop computer started replacing the Correcting Selectrics that once covered office, well, desktops everywhere as the decade plodded along.

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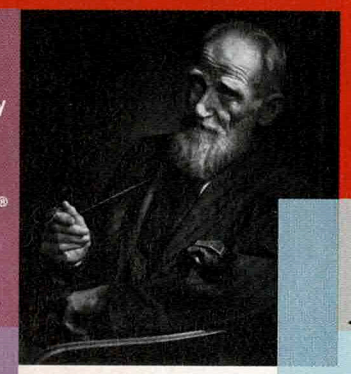
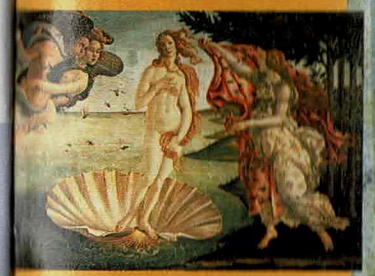


$$\pm\sqrt{a^2r^2+b^2}$$



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